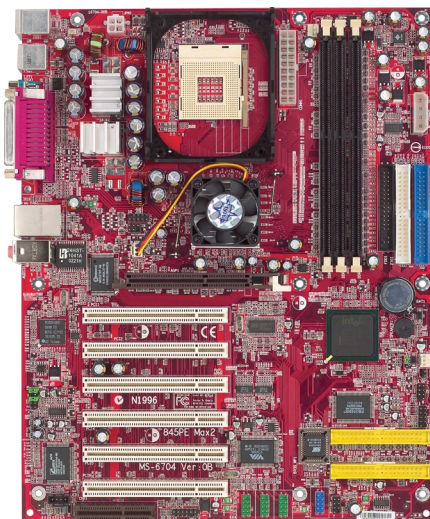




845PE Max2

MS-6704 (v1.X) ATX Mainboard



Version 1.0
G52-M6704X1

Manual Rev: 1.0

Release Date: August 2002



FCC-B Radio Frequency Interference Statement

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

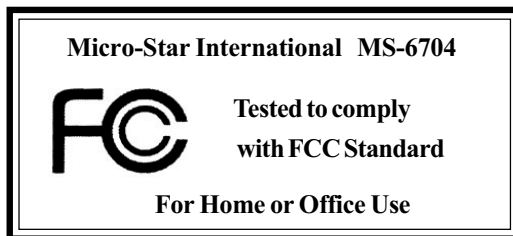
Notice 1

The changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Notice 2

Shielded interface cables and A.C. power cord, if any, must be used in order to comply with the emission limits.

VOIR LA NOTICE D'INSTALLATION AVANT DE RACCORDER AU RESEAU.



Copyright Notice

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AMI® is a registered trademark of American Megatrends Inc.

Revision History

Revision	Revision History	Date
V1.0	First release	August 2002

Technical Support

If a problem arises with your system and no solution can be obtained from the user's manual, please contact your place of purchase or local distributor. Alternatively, please try the following help resources for further guidance.

- 🔍 Visit the MSI website for FAQ, technical guide, BIOS updates, driver updates, and other information: <http://www.msi.com.tw/>
- 🔍 Contact our technical staff at: support@msi.com.tw

Safety Instructions

1. Always read the safety instructions carefully.
2. Keep this User's Manual for future reference.
3. Keep this equipment away from humidity.
4. Lay this equipment on a reliable flat surface before setting it up.
5. The openings on the enclosure are for air convection hence protects the equipment from overheating. **DO NOT COVER THE OPENINGS.**
6. Make sure the voltage of the power source and adjust properly 110/220V before connecting the equipment to the power inlet.
7. Place the power cord such a way that people can not step on it. Do not place anything over the power cord.
8. Always Unplug the Power Cord before inserting any add-on card or module.
9. All cautions and warnings on the equipment should be noted.
10. Never pour any liquid into the opening that could damage or cause electrical shock.
11. If any of the following situations arises, get the equipment checked by a service personnel:
 - The power cord or plug is damaged.
 - Liquid has penetrated into the equipment.
 - The equipment has been exposed to moisture.
 - The equipment has not work well or you can not get it work according to User's Manual.
 - The equipment has dropped and damaged.
 - The equipment has obvious sign of breakage.
12. **DO NOT LEAVE THIS EQUIPMENT IN AN ENVIRONMENT UNCONDITIONED, STORAGE TEMPERATURE ABOVE 60°C (140°F), IT MAY DAMAGE THE EQUIPMENT.**



CAUTION: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type recommended by the manufacturer.

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Getting Started

Thank you for purchasing 845PE Max2 (MS-6704 v1. X) ATX mainboard. The 845PE Max2 is based on **Intel® 845PE & ICH4** chipsets and provides 6 USB 2.0 ports for high-speed data transmission, one SPDIF pinheader for digital audio transmission, and one extra Bluetooth pinheader that fulfills your need for wireless connection. With all these special designs, the 845PE Max2 delivers a high performance and professional desktop platform solution.

Mainboard Specifications

CPU

- Supports Socket 478 for Intel® Pentium 4 processor.
- Supports up to 2.4G/533MHz and higher speed.

Chipset

- Intel® 845PE/845GE (optional) chipset
 - FSB 533 MHz.
 - Integrated video accelerator.
 - Supports DDR 266/333 DDR technology.
 - 1.5 V AGP 4X and PCI advanced high performance memory controller.
- Intel® ICH4 chipset
 - Integrated Direct Sound AC97 audio.
 - Dual channel Ultra DMA 66/100 master mode IDE controller.
 - ACPI & PC2001 compliant enhanced power management.
 - Integrated USB 2.0 controller.

Main Memory

- Supports four memory banks using three 184-pin DDR DIMMs.
- Supports up to 2GB PC2700/PC2100 DDR SDRAMs.
- Supports 2.5v DDR SDRAM.

Slots

- One AGP (Accelerated Graphics Port) slot.
 - Supports AGP 1.5 4x.
- Six 32-bit Master PCI Bus slots.
- One CNR (Communication Network Riser) slot.

On-Board IDE

- Dual IDE controllers integrated in Promise 20275/20276.
- PIO, Bus Master and Ultra DMA66/100/133 operation modes.

On-Board Peripherals

- On-Board Peripherals include:
 - 1 floppy port supports 2 FDDs with 360K, 720K, 1.2M, 1.44M and 2.88Mbytes
 - 1 serial port (COM A)
 - 1 parallel port supports SPP/EPP/ECP mode.

- 1 IrDA connector for with Intel® & MSI pin-definition
- 1 Line-in/Line-out/MIC port
- C-Media 8738 6 channel audio SPDIF (Optional)
- 6 USB 2.0 ports (Rear * 2/ Front * 4)
- 1394 port controlled by VT6306 (Optional)

Bluetooth (Optional)

- 1 Bluetooth connector for wireless connection.

Audio

- C-Media 8738MX/ 8738LX 6-channel audio.

LAN (Optional)

- Intel® 82540EM/82551Dual layout.
 - Integrated Fast Ethernet MAC and PHY in one chip.
 - Supports 10Mb/s, 100Mb/s and 1000Mb/s.
 - Compliance with PCI 2.2.
 - Supports ACPI Power Management.

BIOS

- The mainboard BIOS provides “Plug & Play” BIOS which detects the peripheral devices and expansion cards of the board automatically.
- The mainboard provides a Desktop Management Interface (DMI) function which records your mainboard specifications.
- ACPI 1.0a, APM 1.2, PnP 1.0a, SMBIOS 2.3, USB 2.0, WFM 2.0, Overclock on DDR/AGP/CPU, Voltage adjustment, Boot from LAN, Boot from USB Device 1.1 & 2.0.

Dimension

- ATX Form Factor: 30.5 cm (L) x 24.5 cm (W).

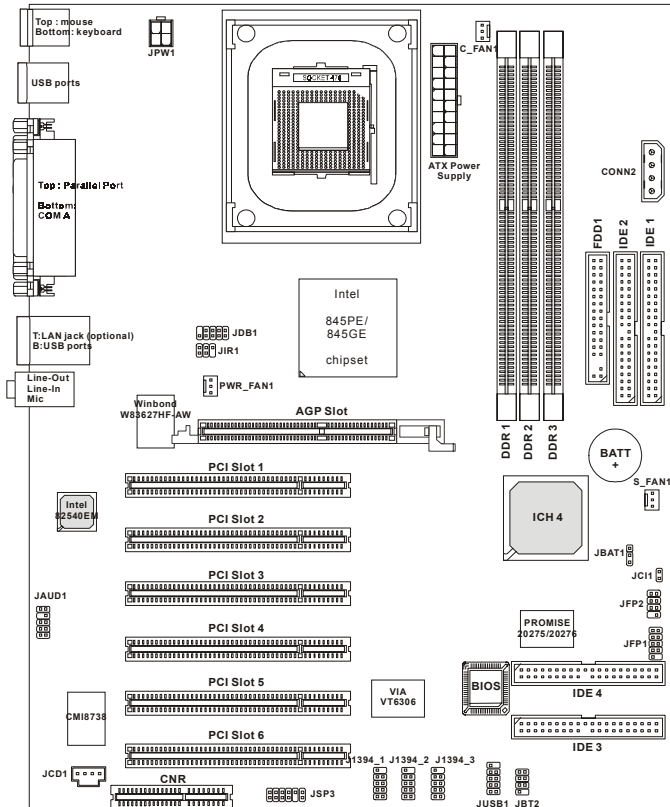
Mounting

- 9 mounting holes.

Others

- PC99 Color Connectors.
- PC2001 compliant.
- WHQL WINXP.

Mainboard Layout



845PE Max2 (MS-6704 v1.X) ATX Mainboard

MSI Special Features

PC Alert™ 4

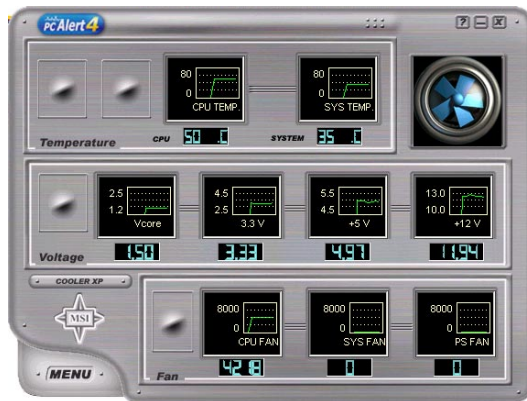
The PC Alert™ 4 is a utility you can find in the CD-ROM disk. The utility is just like your PC doctor that can detect the following PC hardware status during real time operation:

- ♦ monitor CPU & system temperatures
- ♦ monitor fan speed(s)
- ♦ monitor system voltage



If one of the items above is abnormal, the program main screen will be immediately shown on the screen, with the abnormal item highlighted in red. This will continue to be shown until user disables the warning.

To better protect the CPU from overheating, a new feature, **COOLER XP**, has been added to decrease the temperature of AMD Athlon XP CPU. To do so, simply clicking **COOLER XP** and the screen will show a steering wheel (as shown right) with information about the CPU and chipset. Right-click any point on the steering wheel and the system will switch to a different display board with the same CPU and chipset information.



MSI Reminds You...

The new feature **COOLER XP** will work only if your mainboard supports AMD Athlon XP CPU.

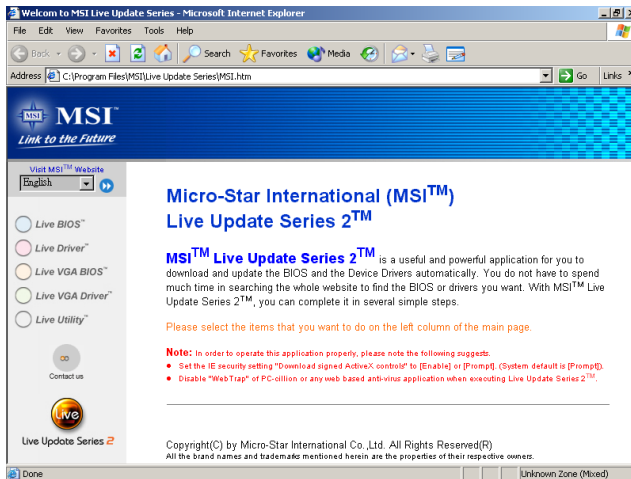
Items shown on PC Alert 4 vary depending on your system's status.

Live BIOS™/Live Driver™

The Live BIOS™/Live Driver™ is a tool used to detect and update your BIOS/drivers online so that you don't need to search for the correct BIOS/driver version throughout the whole Web site. To use the function, you need to install the “MSI Live Update Series 2” application. After the installation, the “MSI Live Update Series 2” icon (as shown on the right) will appear on the screen.



Double click the “MSI Live Update Series 2” icon, and the following screen will appear:



Five buttons are placed on the leftmost pane of the screen. Click the desired button to start the update process.

- ✦ **Live BIOS** – Updates the BIOS online.
- ✦ **Live Driver** – Updates the drivers online.
- ✦ **Live VGA BIOS** – Updates the VGA BIOS online.
- ✦ **Live VGA Driver** – Updates the VGA driver online.
- ✦ **Live Utility** – Updates the utilities online.

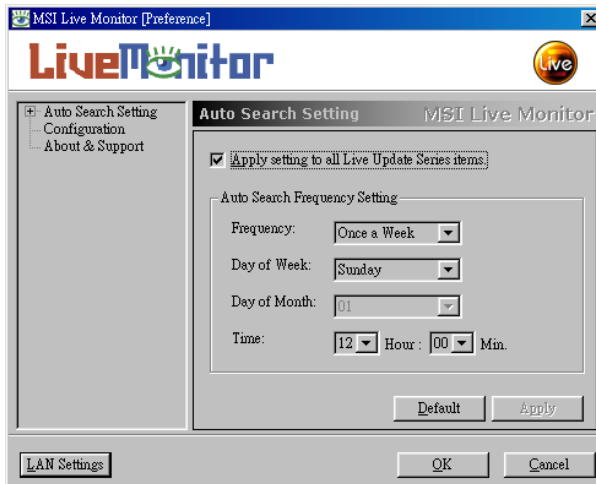
If the product you purchased does not support any of the functions listed above, a “sorry” message is displayed. For more information on the update instructions, insert the companion CD and refer to the “Live Update Series Guide” under the “Manual” Tab.

Live Monitor™

The Live Monitor™ is a tool used to schedule the search for the latest BIOS/drivers version on the MSI Web site. To use the function, you need to install the “MSI Live Update Series 2” application. After the installation, the “MSI Live Monitor” icon (as shown on the right) will appear on the screen. Double click this icon to run the application.



Double click the “MSI Live Monitor” icon  at the lower-right corner of the taskbar, and the following dialog box will appear. You can specify how often the system will automatically search for the BIOS/drivers version, or change the LAN settings right from the dialog box.



You can right-click the MSI Live Monitor icon  to perform the functions listed below:

- ✦ **Auto Search** – Searches for the BIOS/drivers version you need immediately.
- ✦ **View Last Result** – Allows you to view the last search result if there is any.
- ✦ **Preference** – Configures the Search function, including the Search schedule.
- ✦ **Exit** – Exits the Live Monitor™ application.

D-Bracket™ 2 (Optional)

D-Bracket™ 2 is a USB bracket integrating four Diagnostic LEDs, which use graphic signal display to help users understand their system. The LEDs provide up to 16 combinations of signals to debug the system. The 4 LEDs can detect all problems that fail the system, such as VGA, RAM or other failures. This special feature is very useful for overclocking users. These users can use the feature to detect if there are any problems or failures. D-Bracket™ 2 supports both USB 1.1 & 2.0 spec.

D-Bracket™ 2 for mainboard with bluetooth connector (1 port)



D-Bracket™ 2 for mainboard without bluetooth connector (2 ports)



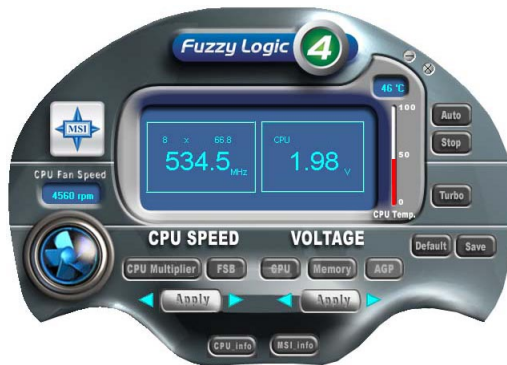
D-Bracket™ 2	Description
	System Power ON - The D-LED will hang here if the processor is damaged or not installed properly.
	Early Chipset Initialization
	Memory Detection Test - Testing onboard memory size. The D-LED will hang if the memory module is damaged or not installed properly.
	Decompressing BIOS image to RAM for fast booting.
	Initializing Keyboard Controller.
	Testing VGA BIOS - This will start writing VGA sign-on message to the screen.

● Red ○ Green

D-Bracket™ 2	Description
	Processor Initialization - This will show information regarding the processor (like brand name, system bus, etc...)
	Testing RTC (Real Time Clock)
	Initializing Video Interface - This will start detecting CPU clock, checking type of video onboard. Then, detect and initialize the video adapter.
	BIOS Sign On - This will start showing information about logo, processor brand name, etc....
	Testing Base and Extended Memory - Testing base memory from 240K to 640K and extended memory above 1MB using various patterns.
	Assign Resources to all ISA.
	Initializing Hard Drive Controller - This will initialize IDE drive and controller.
	Initializing Floppy Drive Controller - This will initializing Floppy Drive and controller.
	Boot Attempt - This will set low stack and boot via INT 19h.
	Operating System Booting

Fuzzy Logic™4

The *Fuzzy Logic™ 4* utility is a user friendly tool that allows users to view and adjust the current system status. To overclock the CPU FSB (Front Side Bus) frequency under the Windows operating system, click **FSB** and use the right and left arrow keys to select the desired FSB, and then click **Apply** to apply the new setup value. To enable the system running at the specified FSB every time when you click **Turbo**, click **Save** to save the desired FSB first. If you want to know the maximal CPU overclocking value, click **Auto** to start testing. The CPU FSB will automatically increase the testing value until the PC reboots. After rebooting, click **Turbo** to apply the test result. Click **Default** to restore the default values.



Features:

- ◆ MSI Logo links to the MSI Web site
- ◆ CPU Speed allows users to adjust the CPU speed through CPU Multiplier and FSB
- ◆ Voltage allows user to adjust the voltage of CPU/Memory/AGP
- ◆ MSI Info provides information about the mainboard, BIOS and OS
- ◆ CPU Info provides detailed information about the CPU
- ◆ CPU Fan Speed shows the current running speed of CPU Fan
- ◆ CPU Temp. shows the current CPU temperature



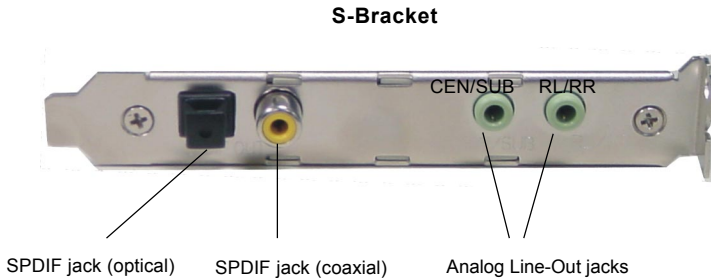
MSI Reminds You...

*To adjust the options under **CPU Speed** and **Voltage**, use the right and left arrow keys to select the desired value and then click **Apply** to run the setup value.*

S-Bracket (Optional)

S-Bracket is a bracket which provides 2 SPDIF jacks for digital audio transmission and 2 analog Line-Out connectors for additional 4-channel analog audio output. With the S-Bracket, your system will be able to perform 6-channel audio operation for wonderful surround sound effect, or connect to Sony & Philips Digital Interface (SPDIF) speakers for audio transmission with better quality.

The S-Bracket offers two types of SPDIF connectors: one for optical fiber and the other for coaxial connection. Select the appropriate one to meet your need. For more information on S-Bracket, refer to *Appendix. Using 4- or 6-Channel Audio Function*.



CPU Thermal Protection

Aimed to prevent the CPU from overheating, MSI has developed a CPU Thermal Protection mechanism for Intel® CPU platform. This CPU Thermal Protection mechanism works on a thermal signal sensor. If the mechanism senses an abnormal temperature rise, it will automatically shut down the system and the CPU temperature will then drop down and resume normal. With this unique feature, users can better protect their CPU. Please note that this feature is for Intel® Pentium CPU only.

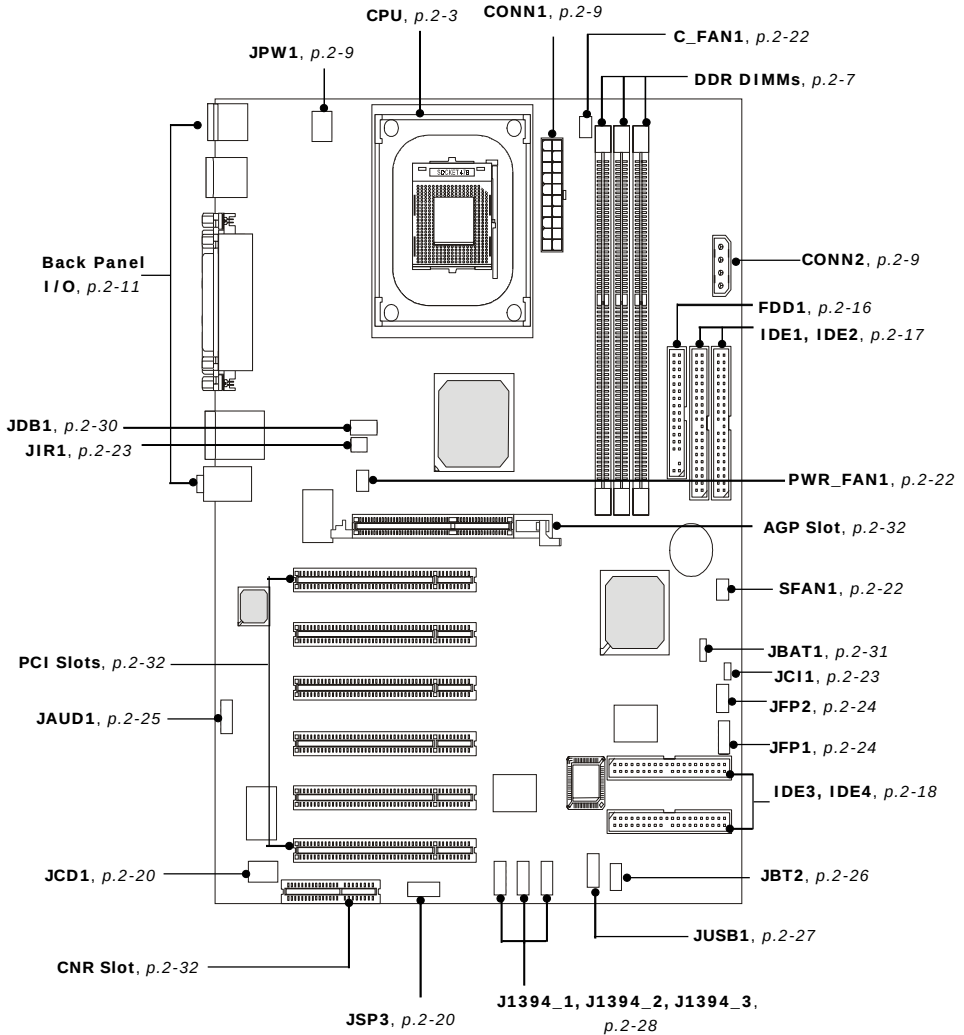
2

Hardware Setup

This chapter tells you how to install the CPU, memory modules, and expansion cards, as well as how to setup the jumpers on the mainboard. Also, it provides the instructions on connecting the peripheral devices, such as the mouse, keyboard, etc.

While doing the installation, be careful in holding the components and follow the installation procedures.

Quick Components Guide



Central Processing Unit: CPU

The mainboard supports Intel® Pentium® 4 processor in the 478 pin package. The mainboard uses a CPU socket called PGA478 for easy CPU installation. When you are installing the CPU, **make sure the CPU has a heat sink and a cooling fan attached on the top to prevent overheating.** If you do not find the heat sink and cooling fan, contact your dealer to purchase and install them before turning on the computer.

CPU Core Speed Derivation Procedure

If	CPU Clock	=	100MHz
	Core/Bus ratio	=	14
then	CPU core speed	=	Host Clock x Core/Bus ratio
		=	100MHz x 14
		=	1.4 GHz



MSI Reminds You...

Overheating

Overheating will seriously damage the CPU and system, always make sure the cooling fan can work properly to protect the CPU from overheating.

Replacing the CPU

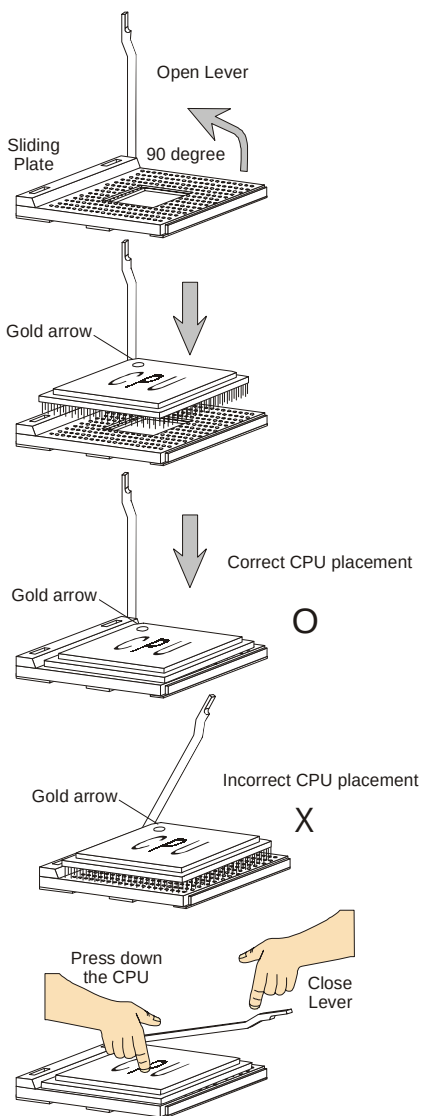
While replacing the CPU, always turn off the ATX power supply or unplug the power supply's power cord from grounded outlet first to ensure the safety of CPU.

Overclocking

*This motherboard is designed to support overclocking. However, please make sure your components are able to tolerate such abnormal setting, while doing overclocking. Any attempt to operate beyond product specifications is not recommended. **We do not guarantee the damages or risks caused by inadequate operation or beyond product specifications.***

CPU Installation Procedures for Socket 478

1. Please turn off the power and unplug the power cord before installing the CPU.
2. Pull the lever sideways away from the socket. Make sure to raise the lever up to a 90-degree angle.
3. Look for the gold arrow. The gold arrow should point towards the lever pivot. The CPU can only fit in the correct orientation.
4. If the CPU is correctly installed, the pins should be completely embedded into the socket and can not be seen. Please note that any violation of the correct installation procedures may cause permanent damages to your mainboard.
5. Press the CPU down firmly into the socket and close the lever. As the CPU is likely to move while the lever is being closed, always close the lever with your fingers pressing tightly on top of the CPU to make sure the CPU is properly and completely embedded into the socket.

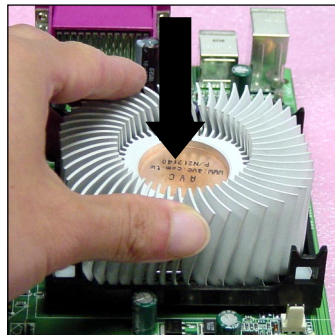
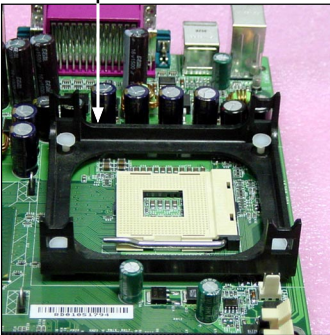


Installing the CPU Fan

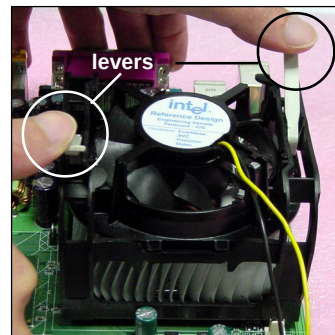
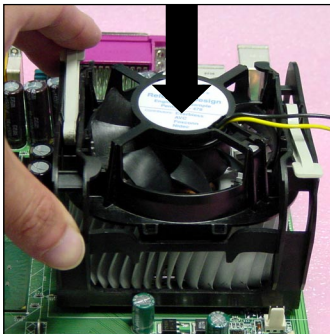
As processor technology pushes to faster speeds and higher performance, thermal management becomes increasingly important. To dissipate heat, you need to attach the CPU cooling fan and heatsink on top of the CPU. Follow the instructions below to install the Heatsink/Fan:

1. Locate the CPU and its retention mechanism on the motherboard.
2. Position the heatsink onto the retention mechanism.

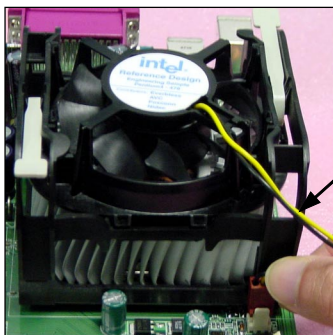
retention mechanism



3. Mount the fan on top of the heatsink. Press down the fan until its four clips get wedged in the holes of the retention mechanism.
4. Press the two levers down to fasten the fan. Each lever can be pressed down in only ONE direction.



5. Connect the fan power cable from the mounted fan to the 3-pin fan power connector on the board.

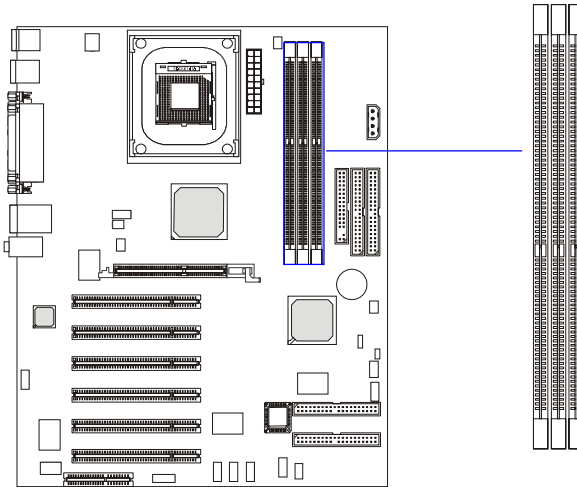


fan power cable



Memory

The mainboard provides 3 slots for 184-pin DDR SDRAM DIMM (Double In-Line Memory Module) modules and supports the memory size up to 2GB. You can install PC2700/DDR333 or PC2100/DDR266 modules on the DDR DIMM slots (DDR 1~3).



DDR DIMM Slots
(DDR 1~3, from left to right)

Introduction to DDR SDRAM

DDR (Double Data Rate) SDRAM is similar to conventional SDRAM, but doubles the rate by transferring data twice per cycle. It uses 2.5 volts as opposed to 3.3 volts used in SDR SDRAM, and requires 184-pin DIMM modules rather than 168-pin DIMM modules used by SDR SDRAM. High memory bandwidth makes DDR an ideal solution for high performance PC, workstations and servers.

DDR Module Combination

To enable normal operation, at least one DIMM module should be installed on the motherboard.

All three slots can be single-sidedly or double-sidedly installed with 184-pin DDR DIMM modules. Please especially note that DDR 1 alone occupies two memory banks; the rest two banks are shared by DDR 2 & DDR 3. You may install memory modules in the following combination:

Slot	Combination		
	1	2	3
DDR 1	S/D	S/D	S/D
DDR 2	S/D	S	
DDR 3		S	
Total Memory	64MB~2GB	64MB~2GB	64MB~2GB

S (Single Side): 64MB ~ 512MB

D (Double Side): 128MB ~ 1GB

Installing DDR Modules

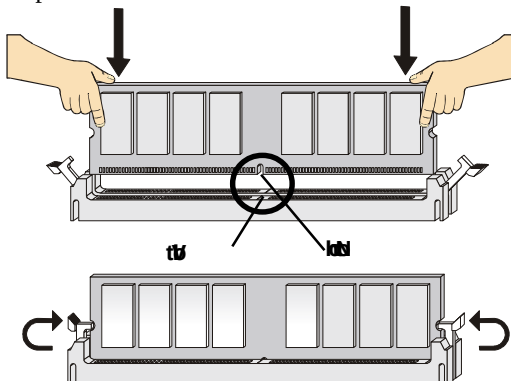
1. The DDR DIMM has only one notch on the center of module. The module will only fit in the right orientation.
2. Insert the DIMM memory module vertically into the DIMM slot. Then push it in until the golden finger on the memory module is deeply inserted in the socket.



MSI Reminds You...

You can barely see the golden finger if the module is properly inserted in the socket.

3. The plastic clip at each side of the DIMM slot will automatically close.



Power Supply

The mainboard supports ATX power supply for the power system. Before inserting the power supply connector, always make sure that all components are installed properly to ensure that no damage will be caused.

ATX 20-Pin Power Connector: CONN1

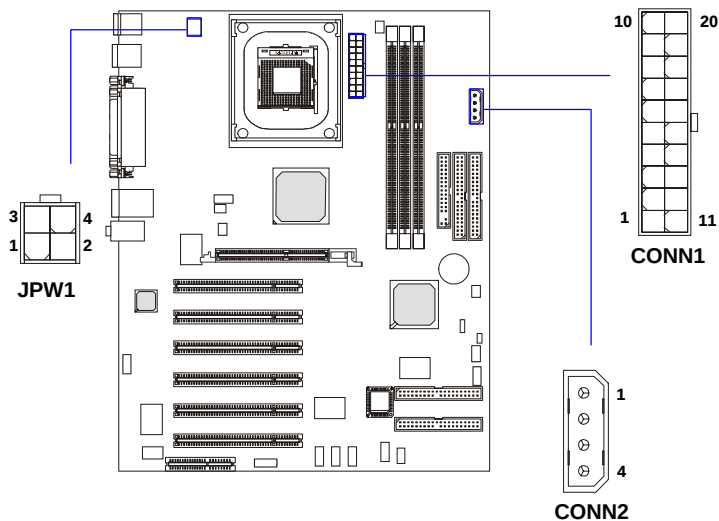
This connector allows you to connect to an ATX power supply. To connect to the ATX power supply, make sure the plug of the power supply is inserted in the proper orientation and the pins are aligned. Then push down the power supply firmly into the connector.

ATX 5V/12V Power Connector: CONN2

This 5V/12V power connector is used to provide power to the components on the mainboard.

ATX 12V Power Connector: JPW1

This 12V power connector is used to provide power to the CPU.



JPW1 Pin Definition

PIN	SIGNAL
1	GND
2	GND
3	12V
4	12V

CONN2 Pin Definition

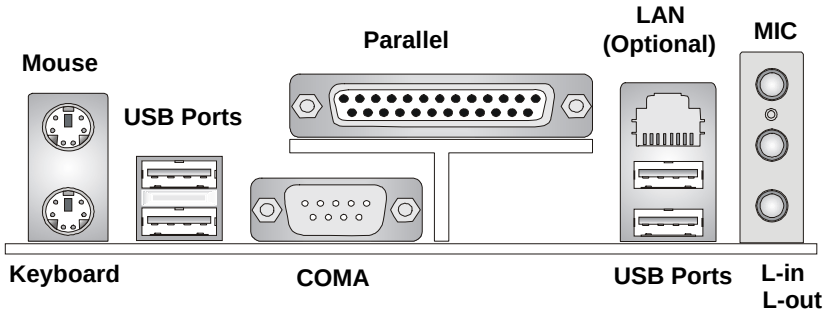
PIN	SIGNAL
1	5V
2	GND
3	GND
4	12V

CONN1 Pin Definition

PIN	SIGNAL	PIN	SIGNAL
1	3.3V	11	3.3V
2	3.3V	12	-12V
3	GND	13	GND
4	5V	14	PS_ON
5	GND	15	GND
6	5V	16	GND
7	GND	17	GND
8	PW_OK	18	-5V
9	5V_SB	19	5V
10	12V	20	5V

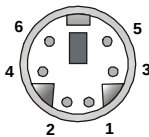
Back Panel

The back panel provides the following connectors:



Mouse Connector

The mainboard provides a standard PS/2[®] mouse mini DIN connector for attaching a PS/2[®] mouse. You can plug a PS/2[®] mouse directly into this connector. The connector location and pin assignments are as follows:



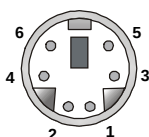
PS/2 Mouse (6-pin Female)

Pin Definition

PIN	SIGNAL	DESCRIPTION
1	Mouse DATA	Mouse DATA
2	NC	No connection
3	GND	Ground
4	VCC	+5V
5	Mouse Clock	Mouse clock
6	NC	No connection

Keyboard Connector

The mainboard provides a standard PS/2® keyboard mini DIN connector for attaching a PS/2® keyboard. You can plug a PS/2® keyboard directly into this connector.



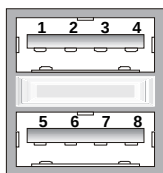
PS/2 Keyboard (6-pin Female)

Pin Definition

PIN	SIGNAL	DESCRIPTION
1	Keyboard DATA	Keyboard DATA
2	NC	No connection
3	GND	Ground
4	VCC	+5V
5	Keyboard Clock	Keyboard clock
6	NC	No connection

USB Connectors

The mainboard provides a UHCI (Universal Host Controller Interface) Universal Serial Bus root for attaching USB devices such as keyboard, mouse or other USB-compatible devices. You can plug the USB device directly into the connector.



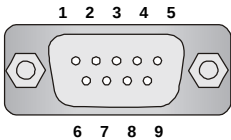
USB Ports

USB Port Description

PIN	SIGNAL	DESCRIPTION
1	VCC	+5V
2	-Data 0	Negative Data Channel 0
3	+Data0	Positive Data Channel 0
4	GND	Ground
5	VCC	+5V
6	-Data 1	Negative Data Channel 1
7	+Data 1	Positive Data Channel 1
8	GND	Ground

Serial Port Connectors: COM A

The mainboard offers one 9-pin male DIN connector as serial port COM A. The port is 16550A high speed communication port that sends/receives 16 bytes FIFOs. You can attach a serial mouse or other serial devices directly to the connector.



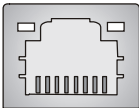
9-Pin Male DIN Connector

Pin Definition

PIN	SIGNAL	DESCRIPTION
1	DCD	Data Carry Detect
2	SIN	Serial In or Receive Data
3	SOUT	Serial Out or Transmit Data
4	DTR	Data Terminal Ready)
5	GND	Ground
6	DSR	Data Set Ready
7	RTS	Request To Send
8	CTS	Clear To Send
9	RI	Ring Indicate

RJ-45 LAN Jack (Optional)

The mainboard provides one standard RJ-45 jack for connection to Local Area Network (LAN). You can connect a network cable to the LAN jack.



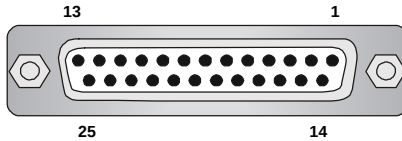
RJ-45 LAN Jack

Pin Definition

PIN	SIGNAL	DESCRIPTION
1	TDP	Transmit Differential Pair
2	TDN	Transmit Differential Pair
3	RDP	Receive Differential Pair
4	NC	Not Used
5	NC	Not Used
6	RDN	Receive Differential Pair
7	NC	Not Used
8	NC	Not Used

Parallel Port Connector: LPT1

The mainboard provides a 25-pin female centronic connector as LPT. A parallel port is a standard printer port that supports Enhanced Parallel Port (EPP) and Extended Capabilities Parallel Port (ECP) mode.



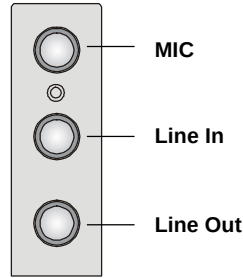
Pin Definition

PIN	SIGNAL	DESCRIPTION
1	STROBE	Strobe
2	DATA0	Data0
3	DATA1	Data1
4	DATA2	Data2
5	DATA3	Data3
6	DATA4	Data4
7	DATA5	Data5
8	DATA6	Data6
9	DATA7	Data7
10	ACK#	Acknowledge
11	BUSY	Busy
12	PE	Paper End
13	SELECT	Select
14	AUTO FEED#	Automatic Feed
15	ERR#	Error
16	INIT#	Initialize Printer
17	SLIN#	Select In
18	GND	Ground
19	GND	Ground
20	GND	Ground
21	GND	Ground
22	GND	Ground
23	GND	Ground
24	GND	Ground
25	GND	Ground

Audio Port Connectors

Line Out is a connector for Speakers or Headphones. **Line In** is used for external CD player, Tape player, or other audio devices. **Mic** is a connector for microphones.

1/8" Stereo Audio Connectors



MSI Reminds You...

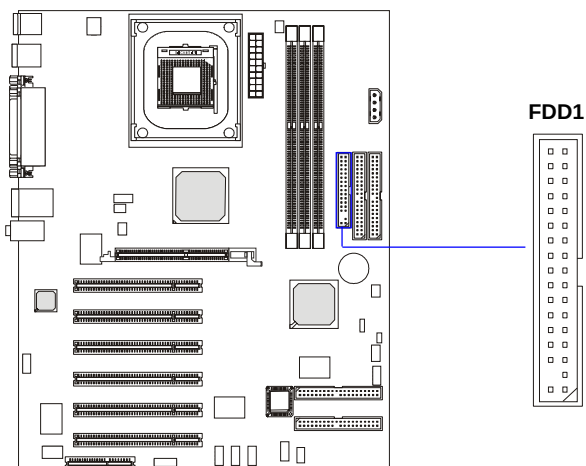
*For advanced audio application, CMedia 8738MX/LX is provided to offer support for **6-channel audio operation** and can turn rear audio connectors from 2-channel to 4-/6-channel audio. For more information on **6-channel audio operation**, please refer to Appendix. Using 4- or 6-Channel Audio Function.*

Connectors

The mainboard provides connectors to connect to FDD, IDE HDD, case, modem, LAN, USB Ports, IR module and CPU/System/Power Supply FAN.

Floppy Disk Drive Connector: FDD1

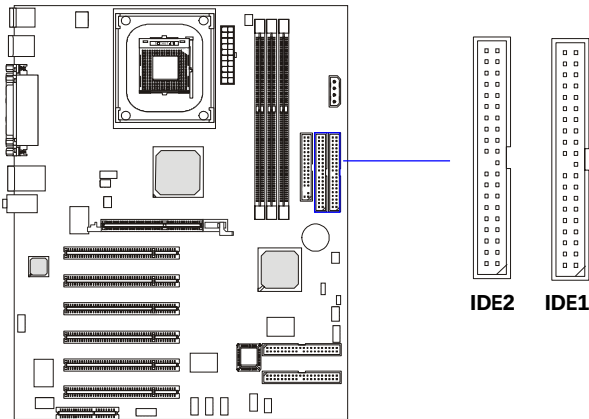
The mainboard provides a standard floppy disk drive connector that supports 360K, 720K, 1.2M, 1.44M and 2.88M floppy disk types.



ATA100 Hard Disk Connectors: IDE1 & IDE2

The mainboard has a 32-bit Enhanced PCI IDE and Ultra DMA 66/100 controller that provides PIO mode 0~4, Bus Master, and Ultra DMA 66/100 function. You can connect up to four hard disk drives, CD-ROM, 120MB Floppy (reserved for future BIOS) and other devices.

The Ultra ATA100 interface boosts data transfer rates between the computer and the hard drive up to 100 megabytes (MB) per second. The new interface is one-third faster than earlier record-breaking Ultra ATA/100 technology and is backwards compatible with the existing Ultra ATA interface.



IDE1 (Primary IDE Connector)

The first hard drive should always be connected to IDE1. IDE1 can connect a Master and a Slave drive. You must configure second hard drive to Slave mode by setting the jumper accordingly.

IDE2 (Secondary IDE Connector)

IDE2 can also connect a Master and a Slave drive.



MSI Reminds You...

If you install two hard disks on cable, you must configure the second drive to Slave mode by setting its jumper. Refer to the hard disk documentation supplied by hard disk vendors for jumper setting instructions.

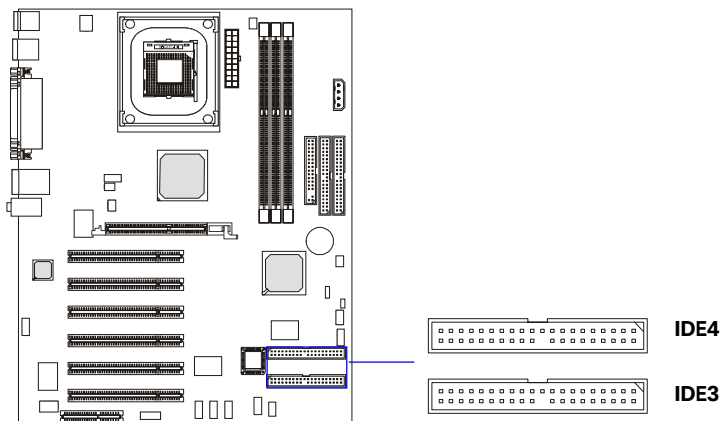
ATA133 RAID Connectors: IDE3 & IDE4 (Optional)

The mainboard offers high-end Ultra ATA133 RAID (0 or 1) hard drive interface specifications supported through Promise® PDC20275 or Promise® PDC20276 controllers.

Promise® PDC20276 controller also offers high-end Ultra ATA/133 RAID (0 or 1) hard drive interface specifications supported through. The low-cost RAID (Redundant Array of Independent Disks) solution integrates two IDE RAID connectors that support PIO mode 0-4, Bus Master, and Ultra DMA 33/66/100/133 modes. The IDE RAID connectors allow you to connect Ultra ATA/DMA hard disks and use RAID technology (RAID 0 striping or RAID 1 mirroring) for high performance, data security and fault tolerance.

ATA133 RAID Connectors

- You can only connect a Master drive to each IDE3 or IDE4 connector.
- For more information on ATA133 RAID, please refer to *Appendix: Installing ATA133 RAID Connector* and *ATA133 RAID 0 or 1 Quick User's Guide*.



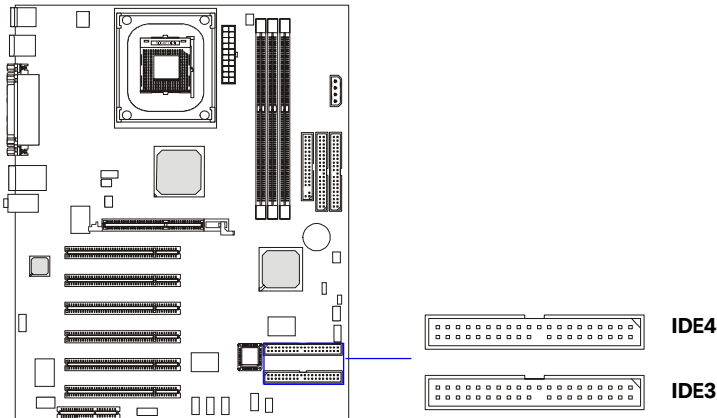
Promise® PDC20275 controller provides Ultra ATA/133 technology, which is a high-end Ultra ATA/133 hard drive interface specification, boosting data transfer rates between the computer and the hard drive up to 133 megabytes (MB) per second. This new interface is one-third faster than earlier record-breaking Ultra ATA/100 technology and is backwards-compatible with the existing Ultra ATA interface.

IDE3

It can connect a Master and a Slave drive. You must configure second hard drive to Slave mode by setting the jumper accordingly.

IDE4

It can also connect a Master and a Slave drive.



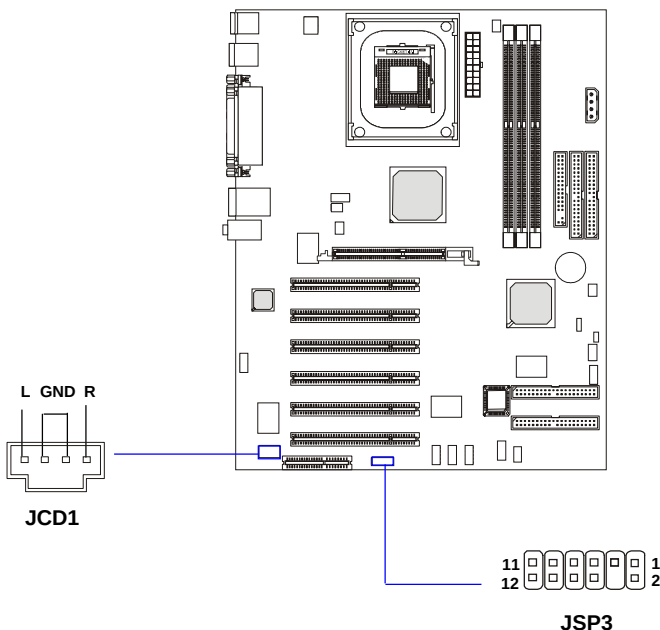
CD-In Connector: JCD1

The connector is for CD-ROM audio connector.

S-Bracket (SPDIF) Connector: JSP3 (Optional)

The connector allows you to connect a S-Bracket for Sony & Philips Digital Interface (SPDIF). The S-Bracket offers 2 SPDIF jacks for digital audio transmission (one for optical fiber connection and the other for coaxial), and 2 analog Line-Out jacks for 4-channel audio output.

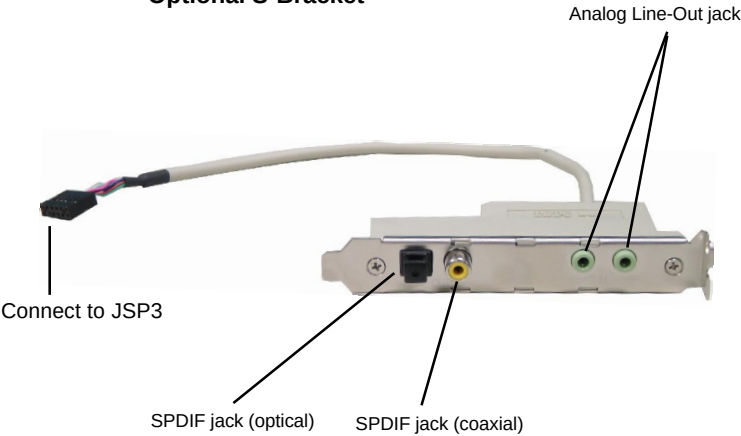
To attach the fiber-optic cable to optical SPDIF jack, you need to remove the plug from the jack first. The two SPDIF jacks support *SPDIF output* only. For more information on the S-Bracket, refer to *Appendix: Using 4- or 6-Channel Audio Function*.



JSP3 Pin Definition

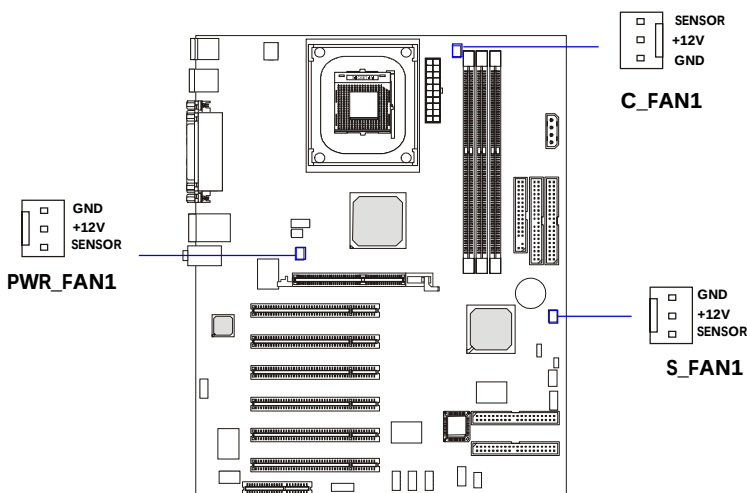
PIN	SIGNAL	DESCRIPTION	PIN	SIGNAL	DESCRIPTION
1	VCC5	VCC 5V	2	VDD3	VDD 3.3V
3	SPDFO	S/PDIF output	4	(No Pin)	Key
5	GND	Ground	6	SPDFI	S/PDIF input
7	LFE-OUT	Audio bass output	8	SOUT-R	Audio right surrounding output
9	CET-OUT	Audio center output	10	SOUT-L	Audio left surrounding output
11	GND	Ground	12	GND	Ground

Optional S-Bracket



Fan Power Connectors: C_FAN1/S_FAN1/PWR_FAN1

The C_FAN1 (processor fan), S_FAN1 (system fan) and PWR_FAN1 (power fan) support system cooling fan with +12V. It supports three-pin head connector. When connecting the wire to the connectors, always take note that the red wire is the positive and should be connected to the +12V, the black wire is Ground and should be connected to GND. If the mainboard has a System Hardware Monitor chipset on-board, you must use a specially designed fan with speed sensor to take advantage of the CPU fan control.

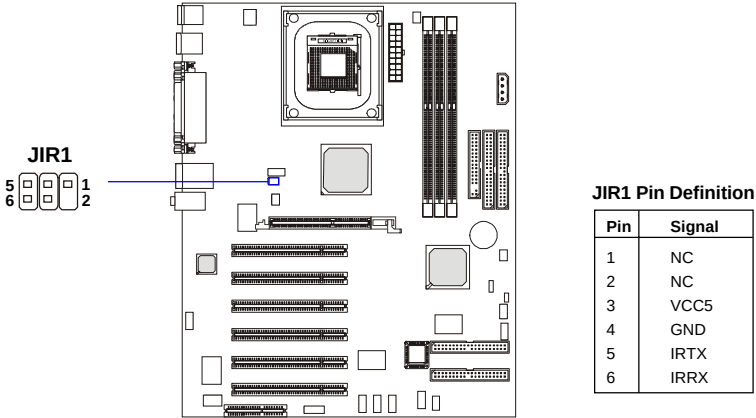


MSI Reminds You...

1. Always consult the vendors for proper CPU cooling fan.
2. C_FAN1 supports the fan control. You can install the PC Alert utility that will automatically control the CPU fan speed according to the actual CPU temperature.

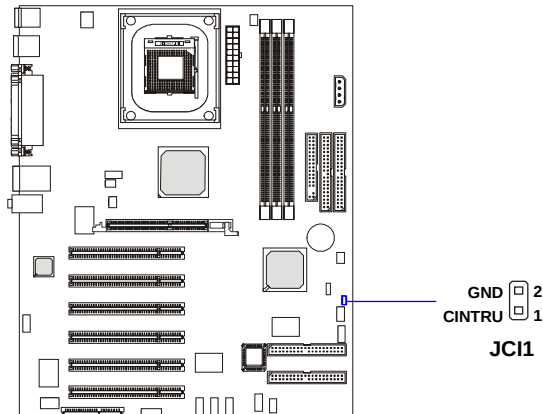
IrDA Infrared Module Header: JIR1

The connector allows you to connect to IrDA Infrared module. You must configure the setting through the BIOS setup to use the IR function. JIR1 is compliant with Intel® Front Panel I/O Connectivity Design Guide.



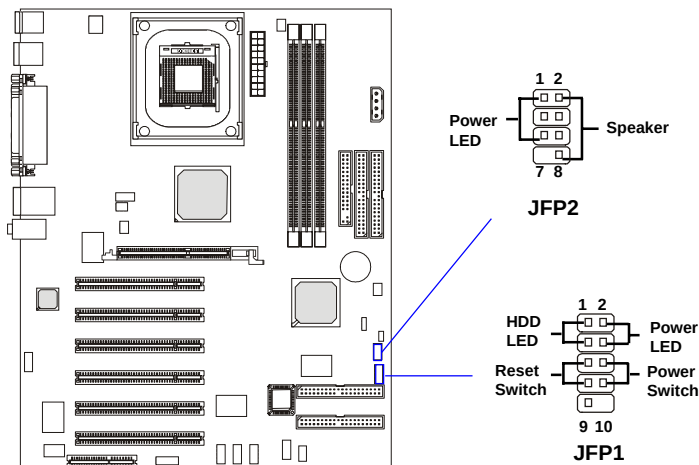
Chassis Intrusion Switch Connector: JCI1

This connector is connected to a 2-pin chassis switch. If the chassis is opened, the switch will be short. The system will record this status and show a warning message on the screen. To clear the warning, you must enter the BIOS utility and clear the record.



Front Panel Connectors: JFP1 & JFP2

The mainboard provides two front panel connectors for electrical connection to the front panel switches and LEDs. JFP1 is compliant with Intel® Front Panel I/O Connectivity Design Guide.



JFP1 Pin Definition

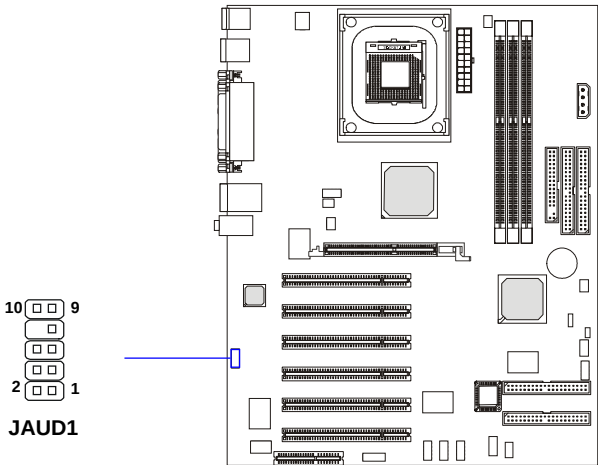
PIN	SIGNAL	DESCRIPTION
1	HD_LED_P	Hard disk LED pull-up
2	FP_PWR/SLP	MSG LED pull-up
3	HD_LED_N	Hard disk active LED
4	FP_PWR/SLP	MSG LED pull-up
5	RST_SW_N	Reset Switch low reference pull-down to GND
6	PWR_SW_P	Power Switch high reference pull-up
7	RST_SW_P	Reset Switch high reference pull-up
8	PWR_SW_N	Power Switch low reference pull-down to GND
9	RSVD_DNU	Reserved. Do not use.

JFP2 Pin Definition

PIN	SIGNAL	PIN	SIGNAL
1	GND	2	SPK-
3	SLED	4	BUZ+
5	PLED	6	BUZ-
7	NC	8	SPK+

Front Panel Audio Connector: JAUD1

The JAUD1 front panel audio connector allows you to connect to the front panel audio and is compliant with Intel® Front Panel I/O Connectivity Design Guide.



JAUD1 Pin Definition

PIN	SIGNAL	DESCRIPTION
1	AUD_MIC	Front panel microphone input signal
2	AUD_GND	Ground used by analog audio circuits
3	AUD_MIC_BIAS	Microphone power
4	AUD_VCC	Filtered +5V used by analog audio circuits
5	AUD_FPOUT_R	Right channel audio signal to front panel
6	AUD_RET_R	Right channel audio signal return from front panel
7	HP_ON	Reserved for future use to control headphone amplifier
8	KEY	No pin
9	AUD_FPOUT_L	Left channel audio signal to front panel
10	AUD_RET_L	Left channel audio signal return from front panel



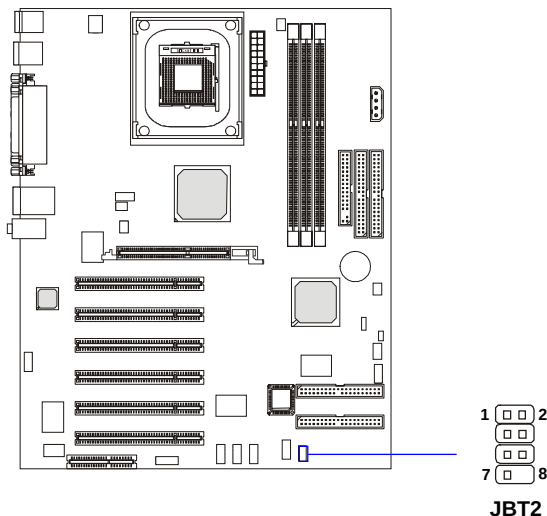
MSI Reminds You...

If you don't want to connect to the front audio header, pins 5 & 6, 9 & 10 have to be jumpered in order to have signal output directed to the rear audio ports. Otherwise, the Line-Out connector on the back panel will not function.



Bluetooth Connector: JBT2 (Optional)

This connector is used to connect a bluetooth module for wireless connection.



JBT2 Pin Definition

PIN	SIGNAL	PIN	SIGNAL
1	5VDUAL	2	3VDUAL
3	D+ (USB signal)	4	GND
5	D- (USB signal)	6	GND
7	GND	8	NC

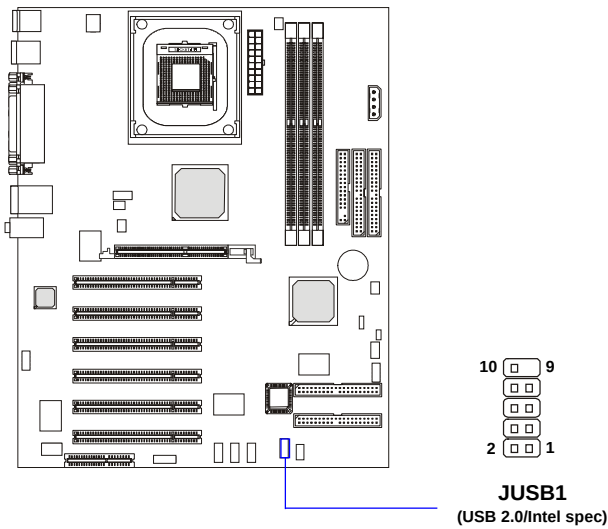


MSI Reminds You...

Because the bluetooth connector shares the USB interface with blue-colored USB2.0 connector, one of the USB2.0 port (see instruction on the cable) will not function when you attach a bluetooth module to this connector.

Front USB Connectors: JUSB1

The mainboard provides one USB 2.0 pin header *JUSB1* that is compliant with Intel® I/O Connectivity Design Guide. USB 2.0 technology increases data transfer rate up to a maximum throughput of 480Mbps, which is 40 times faster than USB 1.1, and is ideal for connecting high-speed USB interface peripherals such as **USB HDD, digital cameras, MP3 players, printers, modems and the like.**

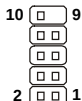
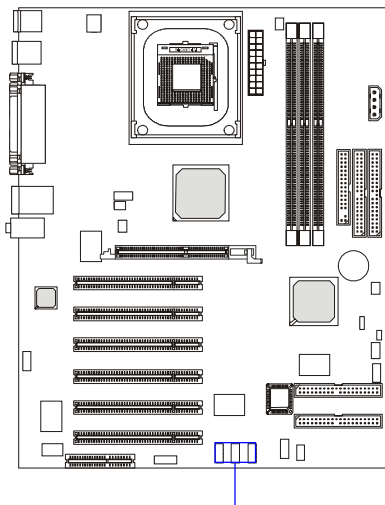


JUSB1 Pin Definition

PIN	SIGNAL	PIN	SIGNAL
1	VCC	2	VCC
3	USB0-	4	USB1-
5	USB0+	6	USB1+
7	GND	8	GND
9	Key	10	USBOC

IEEE 1394 Connectors: J1394_1, J1394_2, J1394_3 (Optional)

The mainboard provides three 1394 pin headers that allow you to connect optional IEEE 1394 ports.

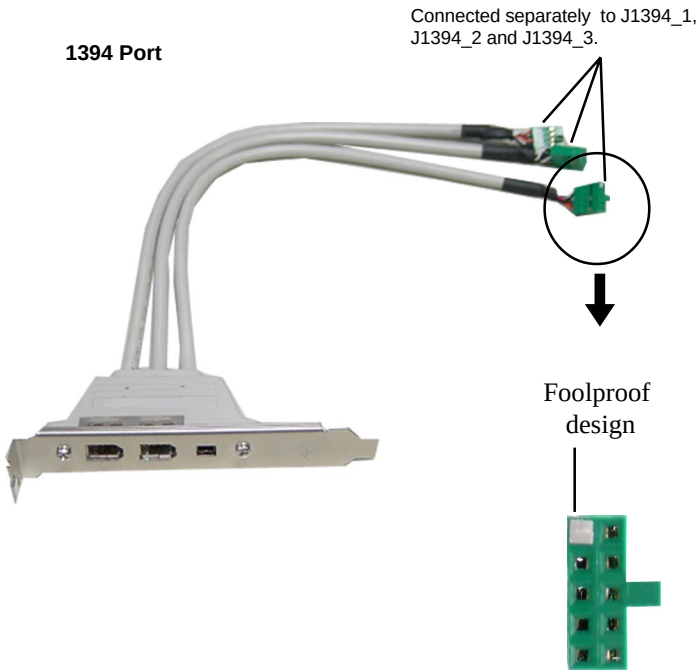


J1394_1, J1394_2, J1394_3
(from left to right)

J1394 Pin Definition

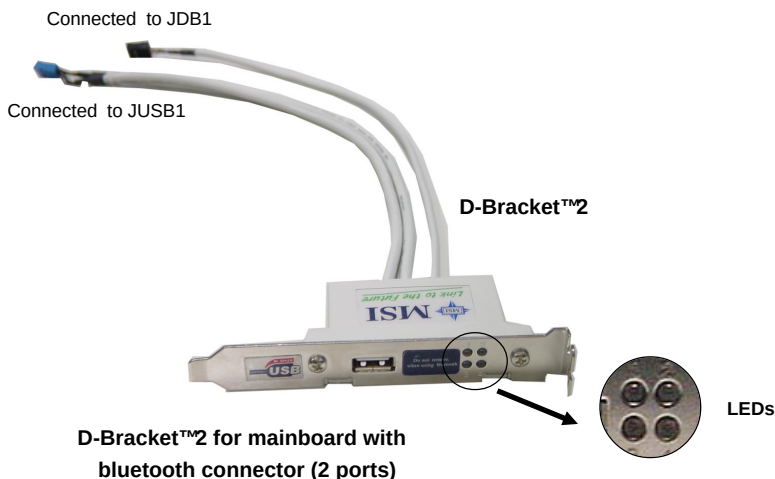
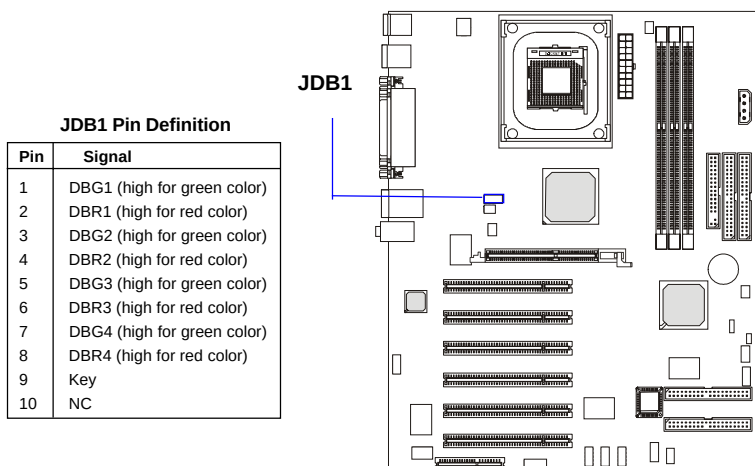
PIN	SIGNAL	PIN	SIGNAL
1	TPA+	2	TPA-
3	Ground	4	Ground
5	TPB+	6	TPB-
7	Cable power	8	Cable power
9	Key (no pin)	10	Ground

How to attach the IEEE 1394 Port:



D-Bracket™2 Connector: JDB1 (Optional)

The mainboard comes with a JDB1 connector for you to connect to D-Bracket™2. D-Bracket™2 is a USB Bracket that supports both USB1.1 & 2.0 spec. It integrates four LEDs and allows users to identify system problem through 16 various combinations of LED signals. For definitions of 16 signal combinations, please refer to *D-Bracket™2* in Chapter 1.

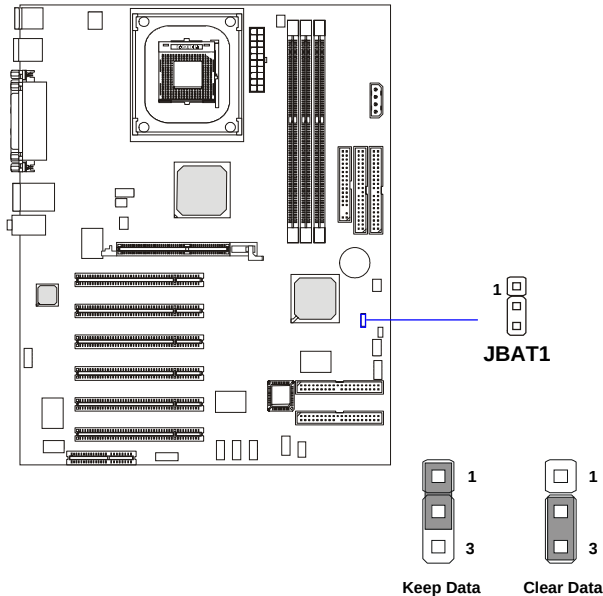


Jumpers

The motherboard provides the following jumpers for you to set the computer's function. This section will explain how to change your motherboard's function through the use of jumpers.

Clear CMOS Jumper: JBAT1

There is a CMOS RAM on board that has a power supply from external battery to keep the data of system configuration. With the CMOS RAM, the system can automatically boot OS every time it is turned on. If you want to clear the system configuration, use the JBAT1 (Clear CMOS Jumper) to clear data. Follow the instructions below to clear the data:

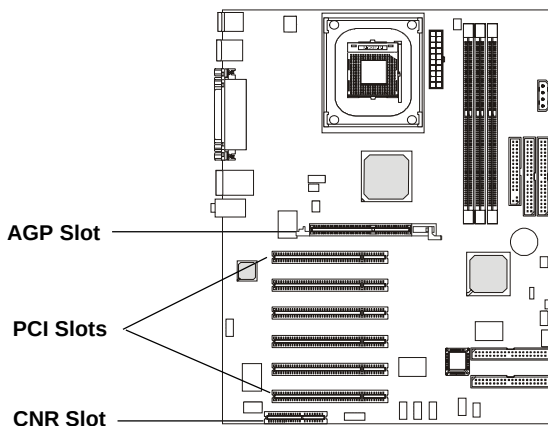


MSI Reminds You...

You can clear CMOS by shorting 2-3 pin while the system is off. Then return to 1-2 pin position. Avoid clearing the CMOS while the system is on; it will damage the mainboard.

Slots

The motherboard provides one AGP slot, six 32-bit PCI bus slots, and one CNR slot.



AGP (Accelerated Graphics Port) Slot

The AGP slot allows you to insert the AGP graphics card. AGP is an interface specification designed for the throughput demands of 3D graphics. It introduces a 66MHz, 32-bit channel for the graphics controller to directly access main memory and provides three levels of throughputs: 1x (266Mbps), 2x (533Mbps) and 4x (1.07Gbps).

PCI (Peripheral Component Interconnect) Slots

The PCI slots allow you to insert the expansion cards to meet your needs. When adding or removing expansion cards, make sure that you unplug the power supply first. Meanwhile, read the documentation for the expansion card to make any necessary hardware or software settings for the expansion card, such as jumpers, switches or BIOS configuration.

CNR (Communication Network Riser) Slot

The CNR slot allows you to insert the CNR expansion cards. CNR is a specially designed network, audio, or modem riser card for ATX family motherboards. Its main processing is done through software and controlled by the motherboard's chipset.

PCI Interrupt Request Routing

The IRQ, acronym of interrupt request line and pronounced I-R-Q, are hardware lines over which devices can send interrupt signals to the microprocessor. The PCI IRQ pins are typically connected to the PCI bus INT A# ~ INT D# pins as follows:

	Order 1	Order 2	Order 3	Order 4
PCI Slot 1	INT A#	INT B#	INT C#	INT D#
PCI Slot 2	INT B#	INT C#	INT D#	INT A#
PCI Slot 3	INT C#	INT D#	INT A#	INT B#
PCI Slot 4	INT D#	INT A#	INT B#	INT C#
PCI Slot 5	INT B#	INT C#	INT D#	INT A#
PCI Slot 6	INT A#	INT B#	INT C#	INT D#



BIOS Setup

This chapter provides information on the BIOS Setup program and allows you to configure the system for optimum use.

You may need to run the Setup program when:

- ◆ An error message appears on the screen during the system booting up, and requests you to run SETUP.
- ◆ You want to change the default settings for customized features.

Entering Setup

Power on the computer and the system will start POST (Power On Self Test) process. When the message below appears on the screen, press <DEL> key to enter Setup.

DEL:Setup F11:Boot Menu F12:Network boot TAB:Logo

If the message disappears before you respond and you still wish to enter Setup, restart the system by turning it OFF and On or pressing the RESET button. You may also restart the system by simultaneously pressing <Ctrl>, <Alt>, and <Delete> keys.

Selecting the First Boot Device

You are allowed to select the 1st boot device without entering the BIOS setup utility by pressing <F11>. When the same message as listed above appears on the screen, press <F11> to trigger the boot menu.

The POST messages might pass by too quickly for you to respond in time. If so, restart the system and press <F11> after around 2 or 3 seconds to activate the boot menu similar to the following.

Select First Boot Device		
Floppy	: 1st Floppy	
IDE-0	: IBM-DTLA-307038	
CDROM	: ATAPI CD-ROM DRIVE 40X M	
[Up / Dn] Select	[RETURN] Boot	[ESC] cancel

The boot menu will list all the bootable devices. Select the one you want to boot from by using arrow keys and then pressing <Enter>. The system will boot from the selected device. The selection will not make changes to the settings in the BIOS setup utility, so next time when you power on the system, it will still use the original first boot device to boot up.

Control Keys

<↑>	Move to the previous item
<↓>	Move to the next item
<←>	Move to the item in the left hand
<→>	Move to the item in the right hand
<Enter>	Select the item
<Esc>	Jumps to the Exit menu or returns to the main menu from a submenu
<+/PU>	Increase the numeric value or make changes
<-/PD>	Decrease the numeric value or make changes
<F5>	Restore the previous CMOS value from CMOS, only for Option Page Setup Menu
<F6>	Load High Performance Defaults
<F7>	Load BIOS Setup Defaults
<F8>	BIOS Languages switch
<F10>	Save all the CMOS changes and exit

Getting Help

After entering the Setup utility, the first screen you see is the Main Menu.

Main Menu

The main menu displays the setup categories the BIOS supplies. You can use the arrow keys (↑↓) to select the item. The on-line description for the selected setup category is displayed at the bottom of the screen.

Default Settings

The BIOS setup program contains two kinds of default settings: the BIOS Setup and High Performance defaults. BIOS Setup defaults provide stable performance settings for all devices and the system, while High Performance defaults provide the best system performance but may affect the system stability.

The Main Menu

Once you enter AMIBIOS NEW SETUP UTILITY, the Main Menu will appear on the screen. The Main Menu displays twelve configurable functions and two exit choices. Use arrow keys to move among the items and press <Enter> to enter the sub-menu.



Standard CMOS Features

Use this menu for basic system configurations, such as time, date etc.

Advanced BIOS Features

Use this menu to setup the items of AMI® special enhanced features.

Advanced Chipset Features

Use this menu to change the values in the chipset registers and optimize your system's performance.

Power Management Features

Use this menu to specify your settings for power management.

PNP/PCI Configurations

This entry appears if your system supports PnP/PCI.

Integrated Peripherals

Use this menu to specify your settings for integrated peripherals.

PC Health Status

This entry shows your PC health status.

Frequency/Voltage Control

Use this menu to specify your settings for frequency/voltage control.

Set Supervisor Password

Use this menu to set Supervisor Password.

Set User Password

Use this menu to set User Password.

Load High Performance Defaults

Use this menu to load the BIOS values for the best system performance, but the system stability may be affected.

Load BIOS Setup Defaults

Use this menu to load factory default settings into the BIOS for stable system performance operations.

Save & Exit Setup

Save changes to CMOS and exit setup.

Exit Without Saving

Abandon all changes and exit setup.

Standard CMOS Features

The items inside STANDARD CMOS SETUP menu are divided into 9 categories. Each category includes none, one or more setup items. Use the arrow keys to highlight the item you want to modify and use the <PgUp> or <PgDn> keys to switch to the value you prefer.

AMIBIOS NEW SETUP UTILITY - VERSION 3.31a			
Standard CMOS Features		[Setup Help]	
System Date	Sep 18 2002 Tue	Month: Jan - Dec	
System Time	09:21:41	Day: 01 - 31	
Current Language	English	Year: 1901 - 2099	
▶ Primary IDE Master	Not Installed		
▶ Primary IDE Slave	Not Installed		
▶ Secondary IDE Master	Not Installed		
▶ Secondary IDE Slave	Not Installed		
Floppy Drive A	Not Installed		
Floppy Drive B	Not Installed		
Boot Sector Virus Protection	Disabled		
F1:Help	F1:Select Item	+/-:Change Values	F7:Setup Defaults
Esc:Previous Menu	Enter:Select	▶Sub-Menu	F6:Hi-Performance

System Time

This allows you to set the system time that you want (usually the current time). The time format is <hour> <minute> <second>.

System Date

This allows you to set the system to the date that you want (usually the current date). The format is <day><month> <date> <year>.

day	Day of the week, from Sun to Sat, determined by BIOS. Read-only.
month	The month from Jan. through Dec.
date	The date from 1 to 31 can be keyed by numeric function keys.
year	The year can be adjusted by users.

Primary/Secondary IDE Master/Slave

Press PgUp/<+> or PgDn/<-> to select the hard disk drive type. The specification of hard disk drive will show up on the right hand according to your

selection.

Type	Select how to define the HDD parameters
Cylinders	Enter cylinder number
Heads	Enter head number
Write Precompensation	Enter write precomp cylinder
Sectors	Enter sector number
Maximum Capacity	Read the maximal HDD capacity
LBA Mode	Select <i>Auto</i> for a hard disk > 512 MB under Windows and DOS, or <i>Disabled</i> under Netware and UNIX
Block Mode	Select <i>Auto</i> to enhance the hard disk performance
Fast Programmed I/O Modes	Select <i>Auto</i> to enhance hard disk performance by optimizing the hard disk timing
32 Bit Transfer Mode	Enable 32 bit to maximize the IDE hard disk data transfer rate

Current Language

This allows you to switch the language of BIOS. Setting options: *English, China (Simplified Chinese), Chinese (Traditional Chinese), Japanese, Korea, French, German.*



Floppy Drive A:/B:

This item allows you to set the type of floppy drives installed. Available options: *Not Installed, 1.2 MB 5¼, 720 KB 3½, 1.44 MB 3½ and 2.88 MB 3½.*

Boot Sector Virus Protection

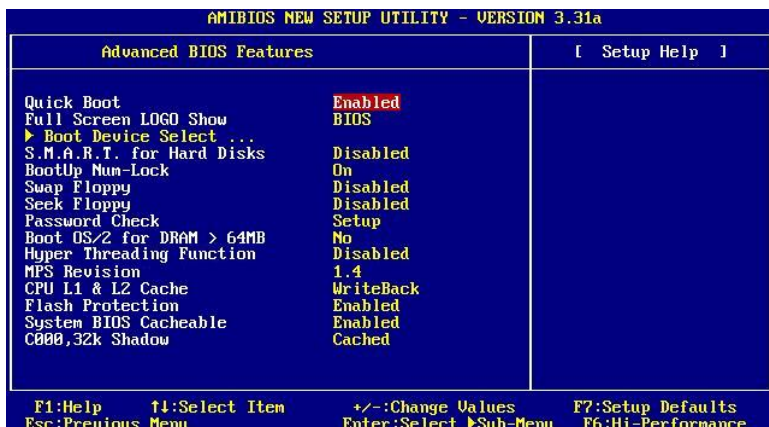
The item is to set the Virus Warning feature for IDE Hard Disk boot sector protection. When *Enabled*, BIOS will issue a virus warning message and beep if a write to the boot sector or the partition table of the HDD is attempted. Setting options: *Disabled and Enabled.*



MSI Reminds You...

This feature only protects the boot sector, not the whole hard disk.

Advanced BIOS Features



Quick Boot

Setting the item to *Enabled* allows the system to boot within 5 seconds since it will skip some check items. Available options: *Enabled*, *Disabled*.

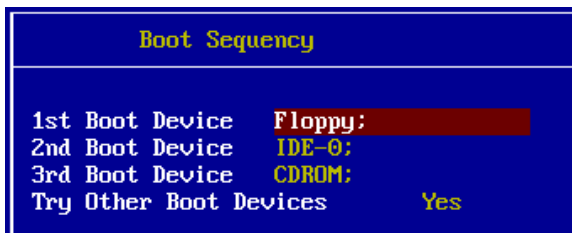
Full Screen Logo Show

This item enables you to show the company logo on the bootup screen. Settings are:

- Silent* Shows a still image (logo) on the full screen at boot.
- BIOS* Shows the POST messages at boot.

Boot Sequency

Press <Enter> to enter the sub-menu screen.



1st/2nd/3rd Boot Device

The items allow you to set the sequence of boot devices where AMIBIOS attempts to load the operating system. The settings are:

- IDE-0* The system will boot from the first HDD.
- IDE-1* The system will boot from the second HDD.
- IDE-2* The system will boot from the third HDD.
- IDE-3* The system will boot from the fourth HDD.
- Floppy* The system will boot from floppy drive.
- ARMD-FDD* The system will boot from any ARMD device, such as LS-120 or ZIP drive, that functions as a floppy drive.
- ARMD-HDD* The system will boot from ARMD device, such as MO or ZIP drive, that functions as hard disk drive.
- CD/DVD* The system will boot from the CD-ROM.
- Legacy SCSI* The system will boot from the SCSI.
- Legacy NETWORK* The system will boot from the Network drive.
- BBS-0* The system will boot from the first BBS (BIOS Boot Specification) compliant device.
- BBS-1* The system will boot from the second BBS (BIOS Boot Specification) compliant device.
- BBS-2* The system will boot from the third BBS (BIOS Boot Specification) compliant device.
- BBS-3* The system will boot from the fourth BBS (BIOS Boot Specification) compliant device.
- USB FDD* The system will boot from USB-interfaced floppy drive.
- USB CDROM* The system will boot from the USB-interfaced CD-ROM.
- USB HDD* The system will boot from the USB-interfaced HDD.
- USB RMD-FDD* The system will boot from any USB-interfaced ARMD device, such as LS-120 or ZIP drive, that functions as a floppy drive.
- USB RMD-HDD* The system will boot from USB-interfaced ARMD device, such as MO or ZIP drive, that functions as hard disk drive.
- Disabled* Disable this sequence.

**MSI Reminds You...**

Available settings for “1st/2nd/3rd Boot Device” vary depending on the bootable devices you have installed. For example, if you did not install a floppy drive, the setting “Floppy” does not show up.

Try Other Boot Device

Setting the option to *Yes* allows the system to try to boot from other devices if the system fails to boot from the 1st/2nd/3rd boot device.

S.M.A.R.T. for Hard Disks

This allows you to activate the S.M.A.R.T. (Self-Monitoring Analysis & Reporting Technology) capability for the hard disks. S.M.A.R.T is a utility that monitors your disk status to predict hard disk failure. This gives you an opportunity to move data from a hard disk that is going to fail to a safe place before the hard disk becomes offline. Settings: *Enabled, Disabled*.

BootUp Num-Lock

This item is to set the Num Lock status when the system is powered on. Setting to *On* will turn on the Num Lock key when the system is powered on. Setting to *Off* will allow end users to use the arrow keys on the numeric keypad. Setting options: *On, Off*.

Swap Floppy

Setting to *Enabled* will swap floppy drives A: and B:.

Seek Floppy

This setting causes the BIOS to search for floppy disk drives at boot time. When enabled, the BIOS will activate the floppy disk drives during the boot process: the drive activity light will come on and the head will move back and forth once. First A: will be done and then B: if it exists. Setting options: *Disabled, Enabled*.

Password Check

This specifies the type of AMIBIOS password protection that is implemented. Setting options are described below.

Option	Description
Setup	The password prompt appears only when end users try to run Setup.
Always	A password prompt appears every time when the computer is powered on or when end users try to run Setup.

Boot OS/2 for DRAM > 64 MB

This allows you to run the OS/2® operating system with DRAM larger than 64MB. When you choose *No*, you cannot run the OS/2® operating system with DRAM larger than 64MB. But it is possible if you choose *Yes*.

Hyper Threading Function

This field is used to enable or disable the Hyper Threading function. Setting to *Enabled* will increase the system performance. Settings: *Enabled, Disabled*.

**MSI Reminds You...**

Enabling the functionality of Hyper-Threading Technology for your computer system requires ALL of the following platform Components:

- *CPU: An Intel® Pentium® 4 Processor with HT Technology;
- *Chipset: An Intel® Chipset that supports HT Technology;
- *BIOS: A BIOS that supports HT Technology and has it enabled; and
- *OS: An operating system that supports HT Technology.

For more information on Hyper-threading Technology, go to:
www.intel.com/info/hyperthreading

MPS Revision

This field allows you to select which MPS (Multi-Processor Specification) version to be used for the operating system. You need to select the MPS version supported by your operating system. Settings: *1.4* and *1.1*.

CPU L1 & L2 Cache

Cache memory is additional memory that is much faster than conventional DRAM (system memory). When the CPU requests data, the system transfers the requested data from the main DRAM into cache memory, for even faster access by the CPU. The setting controls the internal cache (also known as L1 or level 1 cache). Setting to *WriteBack* will speed up the system performance.

Flash Protection

This function protects the BIOS from accidental corruption by unauthorized users or computer viruses. When enabled, the BIOS' data cannot be changed when attempting to update the BIOS with a Flash utility. To successfully update the BIOS, you'll need to disable this Flash Protection function. Setting options: *Enabled, Disabled*.

System BIOS Cacheable

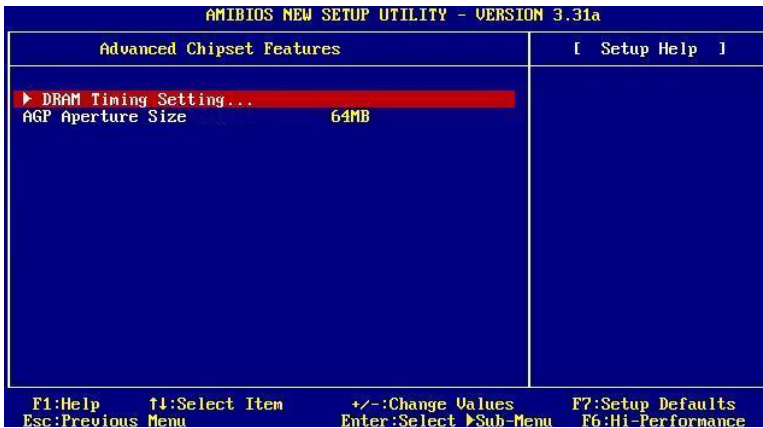
Selecting *Enabled* allows caching of the system BIOS ROM at F0000h-FFFFFh, resulting in better system performance. However, if any program writes to this memory area, a system error may result. Setting options: *Enabled*, *Disabled*.

C000, 32k Shadow

This item specifies how the contents of the adapter ROM named in the item are handled. Settings are described below:

Option	Description
Disabled	The specified ROM is not copied to RAM.
Enabled	The contents of specified ROM are copied to RAM for faster system performance.
Cached	The contents of specified ROM are not only copied to RAM, the contents of the ROM area can be written to and read from cache memory.

Advanced Chipset Features



MSI Reminds You...

Change these settings only if you are familiar with the chipset.

DRAM Timing Setting

Press <Enter> and the following sub-menu appears.



DRAM Frequency

Use this field to configure the clock frequency of the installed DRAM. Settings are: *SPD*, 200MHz, 266MHz, 333MHz, *Auto*.

Configure SDRAM Timing by SPD

Selects whether DRAM timing is controlled by the SPD (Serial Presence Detect) EEPROM on the DRAM module. Setting to *Enabled* enables

the following fields automatically to be determined by BIOS based on the configurations on the SPD. Selecting Disabled allows users to configure these fields manually.

CAS# Latency

This controls the timing delay (in clock cycles) before SDRAM starts a read command after receiving it. Settings: 2, 2.5 (clocks). 2 (clocks) increases the system performance the most while 2.5 (clocks) provides the most stable performance.

RAS# Precharge

This item controls the number of cycles for Row Address Strobe (RAS) to be allowed to precharge. If insufficient time is allowed for the RAS to accumulate its charge before DRAM refresh, refresh may be incomplete and DRAM may fail to retain data. This item applies only when synchronous DRAM is installed in the system. Available settings: *2 clocks, 3 clocks*.

RAS# to CAS# Delay

When DRAM is refreshed, both rows and columns are addressed separately. This setup item allows you to determine the timing of the transition from RAS (row address strobe) to CAS (column address strobe). The less the clock cycles, the faster the DRAM performance. Setting options: *3 clocks, 2 clocks*.

Precharge Delay

This setting controls the precharge delay, which determines the timing delay for DRAM precharge. Settings: *5 clocks, 6 clocks, 7 clocks*.

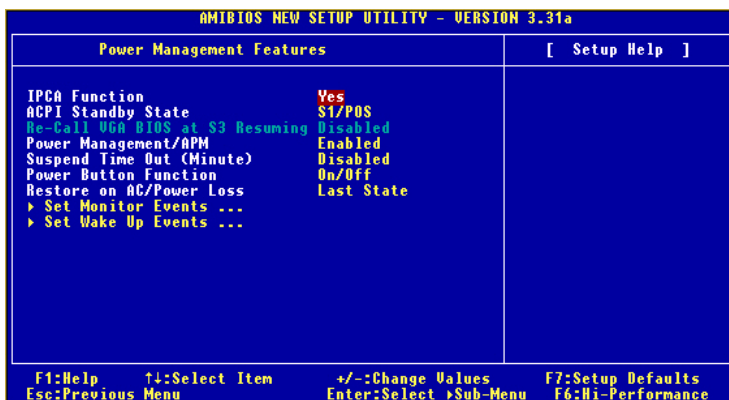
Burst Length

This setting allows you to set the size of Burst-Length for DRAM. Bursting feature is a technique that DRAM itself predicts the address of the next memory location to be accessed after the first address is accessed. To use the feature, you need to define the burst length, which is the actual length of burst plus the starting address and allows internal address counter to properly generate the next memory location. The bigger the size, the faster the DRAM performance. Available settings: *4, 8*.

AGP Aperture Size

This setting controls just how much system RAM can be allocated to AGP for video purposes. The aperture is a portion of the PCI memory address range dedicated to graphics memory address space. Host cycles that hit the aperture range are forwarded to the AGP without any translation. The option allows the selection of an aperture size of *4MB, 8MB, 16MB, 32MB, 64MB, 128MB, and 256 MB*.

Power Management Features



MSI Reminds You...

S3-related functions described in this section are available only when your BIOS supports S3 sleep mode.

IPCA Function

This item is to activate the ACPI (Advanced Configuration and Power Management Interface) function. If your operating system is ACPI-aware, such as Windows 98SE/2000/ME, select Yes. Available options: Yes, No.

ACPI Standby State

This item specifies the power saving modes for ACPI function. If your operating system supports ACPI, such as Windows 98SE, Windows ME and Windows 2000, you can choose to enter the Standby mode in S1(POS) or S3 (STR) fashion through the setting of this field. Options are:

- S1/POS** The S1 sleep mode is a low power state. In this state, no system context is lost (CPU or chipset) and hardware maintains all system context.
- S3/STR** The S3 sleep mode is a lower power state where the information of system configuration and open applications/files is saved to main memory that remains powered while most other hardware components turn off to save energy. The information stored in memory will be used

to restore the system when a “wake up” event occurs.

Auto BIOS determines the best mode automatically.

Re-Call VGA BIOS at S3 Resuming

Selecting *Enabled* allows BIOS to call VGA BIOS to initialize the VGA card when system wakes up (resumes) from S3 sleep state. The system resume time is shortened when you disable the function, but system will need an AGP driver to initialize the VGA card. Therefore, if the AGP driver of the card does not support the initialization feature, the display may work abnormally or not function after resuming from S3.

Power Management/APM

Setting to *Enabled* will activate an Advanced Power Management (APM) device to enhance Max Saving mode and stop CPU internal clock. Settings: *Disabled, Enabled*.

Suspend Time Out (Minute)

After the selected period of system inactivity, all devices except the CPU shut off. Settings: *Disabled, 1, 2, 4, 8, 10, 20, 30, 40, 50, 60*.

Power Button Function

This feature sets the function of the power button. Settings are:

<i>On/Off</i>	The power button functions as normal power off button.
<i>Suspend</i>	When you press the power button, the computer enters the suspend/sleep mode, but if the button is pressed for more than four seconds, the computer is turned off.

Restore on AC/Power Loss

This setting specifies whether your system will reboot after a power failure or interrupt occurs. Available settings are:

<i>Power Off</i>	Leaves the computer in the power off state.
<i>Power On</i>	Reboots the computer.
<i>Last State</i>	Restores the system to the previous status before power failure or interrupt occurred.

Set Monitor Events

Press <Enter> and the following sub-menu appears.

Set Monitor Events ...	
FDC/LPT/COM Ports	Monitor
Primary Master IDE	Monitor
Primary Slave IDE	Ignore
Secondary Master IDE	Monitor
Secondary Slave IDE	Ignore

FDC/LPT/COM Ports, Primary/Secondary Master/Slave IDE

These items specify if the BIOS will monitor the activity of the specified hardware peripherals or components. If set to *Monitor*, any activity detected on the specified hardware peripherals or components will wake up the system or prevent the system from entering the power saving modes. Settings: *Monitor*, *Ignore*.

Set WakeUp Events

Press <Enter> and the following sub-menu appears.

Set Wake Up Events ...	
Resume On Ring	Enabled
Resume On PME#	Enabled
Resume On RTC Alarm	Disabled
RTC Alarm Date	15
RTC Alarm Hour	12
RTC Alarm Minute	30
RTC Alarm Second	30
USB Wakeup From S3	Disabled
Keyboard Wakeup From S3	Disabled
Specific Key for Wakeup	N/A
Mouse Wakeup From S3	Disabled

Resume On Ring, Resume On PME#

These fields specify whether the system will be awakened from power saving modes when activity or input signal of the specified hardware peripheral or component is detected. Settings: *Enabled*, *Disabled*.

Resume By RTC Alarm

This is used to enable or disable the feature of booting up the system on a scheduled time/date from the soft off (S5) state. Settings: *Enabled, Disabled*.

Alarm Date/Hour/Minute/Second

If *Resume By Alarm* is set to *Enabled*, the system will automatically resume (boot up) on a specific date/hour/minute/second specified in these fields. Available settings for each item are:

Alarm Date	01 ~ 31, Every Day
Alarm Hour	00 ~ 23
Alarm Minute	00 ~ 59
Alarm Second	00 ~ 59

**MSI Reminds You...**

If you have changed this setting, you must let the system boot up until it enters the operating system, before this function will work.

USB Wakeup From S3

This controls how the USB devices can power on the system. Settings: *Enabled, Disabled*.

Keyboard Wakeup From S3

This controls how the PS/2 keyboard can power on the system. Settings: *Password, Any Key, Disabled*.

Specific Key for Wakeup

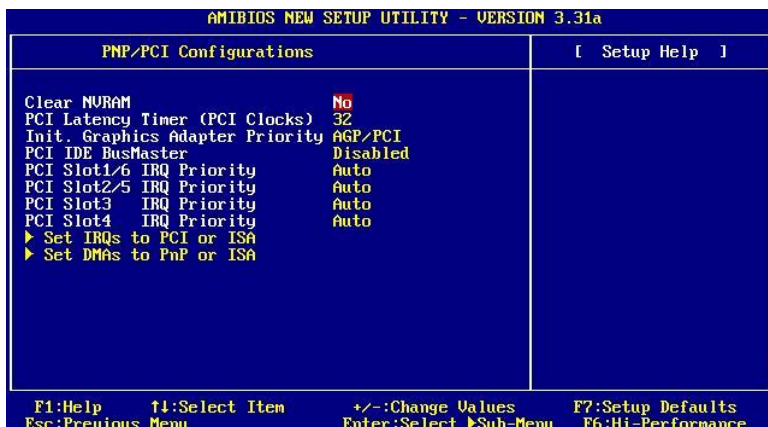
Specify the password to enable for the “Keyboard Wakeup From S3 “ while setting to *Specific Key*.

Mouse Wakeup From S3

This controls how the PS/2 mouse can power on the system. Settings: *Left-button, Right-button, Disabled*.

PNP/PCI Configurations

This section describes configuring the PCI bus system and PnP (Plug & Play) feature. PCI, or **P**eripheral **C**omponent **I**nterconnect, is a system which allows I/O devices to operate at speeds nearing the speed the CPU itself uses when communicating with its special components. This section covers some very technical items and it is strongly recommended that only experienced users should make any changes to the default settings.



Clear NVRAM

The ESCD (Extended System Configuration Data) NVRAM (Non-volatile Random Access Memory) is where the BIOS stores resource information for both PNP and non-PNP devices in a bit string format. When the item is set to Yes, the system will reset ESCD NVRAM right after the system is booted up and then set the setting of the item back to *No* automatically.

PCI Latency Timer (PCI Clocks)

This item controls how long each PCI device can hold the bus before another takes over. When set to higher values, every PCI device can conduct transactions for a longer time and thus improve the effective PCI bandwidth. For better PCI performance, you should set the item to higher values. Settings range from 32 to 248 at a 32 increment.

Init. Graphics Adaptor Priority

This setting specifies which VGA card is your primary graphics adapter. Setting options are:

<i>PCI/AGP</i>	The system initializes the installed PCI VGA card first. If the PCI VGA card is not available, it will initialize the AGP card.
<i>AGP/PCI</i>	The system initializes the installed AGP card first. If the AGP card is not available, it will initialize the PCI VGA card.

PCI IDE BusMaster

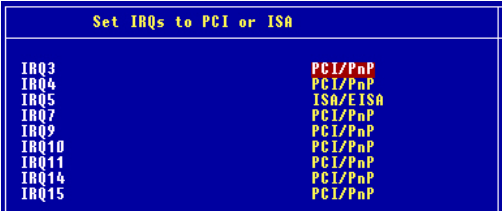
Set this option to *Enabled* to specify that the IDE controller on the PCI local bus has bus mastering capability. Settings options: *Disabled, Enabled*.

PCI Slot1/6 IRQ Priority, PCI Slot2/5 IRQ Priority, PCI Slot3 IRQ Priority, PCI Slot4 IRQ Priority

These items specify the IRQ line for each PCI slot. Setting options: 3, 4, 5, 7, 9, 10, 11, *Auto*. Selecting *Auto* allows BIOS to automatically determine the IRQ line for each PCI slot.

Set IRQs to PCI or ISA

Press <Enter> to enter the sub-menu and the following screen appears:



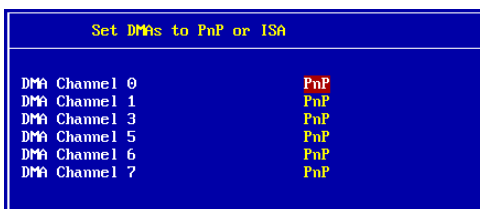
IRQ 3/4/5/7/9/10/11/14/15

These items specify the bus where the specified IRQ line is used. The settings determine if AMIBIOS should remove an IRQ from the pool of available IRQs passed to devices that are configurable by the system BIOS. The available IRQ pool is determined by reading the ESCD NVRAM. If more IRQs must be removed from the IRQ pool, the end user can use these settings to reserve the IRQ by assigning an *ISA/EISA*

setting to it. Onboard I/O is configured by AMIBIOS. All IRQs used by onboard I/O are configured as *PCI/PnP*. If all IRQs are set to *ISA/EISA*, and IRQ 14/15 are allocated to the onboard PCI IDE, IRQ 9 will still be available for PCI and PnP devices. Available settings: *ISA/EISA* and *PCI/PnP*.

Set DMAs to PnP or ISA

Press <Enter> to enter the sub-menu and the following screen appears:



DMA Channel 0/1/3/5/6/7

These items specify the bus that the system DMA (Direct Memory Access) channel is used.

The settings determine if AMIBIOS should remove a DMA from the available DMAs passed to devices that are configurable by the system BIOS. The available DMA pool is determined by reading the ESCD NVRAM. If more DMAs must be removed from the pool, the end user can reserve the DMA by assigning an *ISA/EISA* setting to it.

Integrated Peripherals

Integrated Peripherals		[Setup Help]
USB Controller	Enabled	
USB Legacy Support	Disabled	
On-Chip IDE	Both	
OnBoard LAN	Enabled	
OnBoard IDE Raid	Enabled	
Load OnBoard IDE Raid BIOS	Enabled	
OnBoard Audio	Enabled	
OnBoard 1394	Enabled	
AC'97 Audio	Auto	
AC'97 Modem	Auto	
► Set Super I/O		
F1:Help F4:Select Item +/-:Change Values F7:Setup Defaults Esc:Previous Menu Enter:Select ►Sub-Menu F6:Hi-Performance		

Please note that the options showed on your BIOS might be different depending on the motherboard you buy.

USB Controller

This setting is used to enable/disable the onboard USB controllers.

USB Legacy Support

Set to *All Device* if your need to use any USB 1.1/2.0 device in the operating system that does not support or have any USB 1.1/2.0 driver installed, such as DOS and SCO Unix. Set to *No Mice* only if your want to use any USB device other than the USB mouse. Setting options: *Disabled, No Mice, All Device*.

On-Chip IDE

This setting controls the on-chip IDE controller. Setting options: *Disabled, Primary, Secondary, Both*.

Onboard LAN

The field determines whether the onboard LAN controller is activated. Setting options: *Enabled, Disabled*.

Onboard IDE RAID

This allows you to enable/disable the onboard ATA133 RAID controller. Setting options: *Disabled, Enabled*.

Load OnBoard IDE Raid BIOS

The field determines whether the onboard ATA133RAID controller is loaded. Setting options: *Enabled, Disabled*.

Onboard Audio

Enabled allows the mainboard to detect whether an audio device is used. If the device is detected, the onboard C-Media 8738MX/LX controller will be enabled; if not, it is disabled. Disable the controller if you want to use other controller cards to connect an audio device. Settings: *Enabled, Disabled*.

Onboard 1394

Enabled allows the mainboard to detect whether an 1394 device is used. If the device is detected, the onboard 1394 controller will be enabled; if not, it is disabled. Settings: *Enabled, Disabled*.

AC' 97 Audio

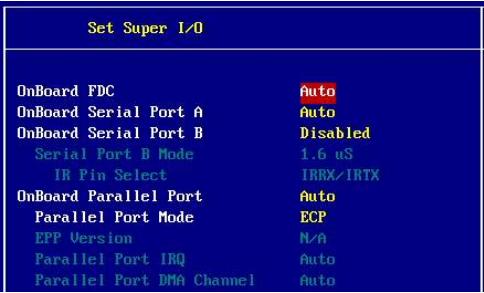
Auto allows the mainboard to detect whether an audio device is used. If the device is detected, the onboard AC' 97 (Audio Codec' 97) controller will be enabled; if not, it is disabled. Disable the controller if you want to use other controller cards to connect an audio device. Settings: *Auto, Disabled*.

AC' 97 Modem

Auto allows the mainboard to detect whether a modem is used. If a modem is used, the onboard MC' 97 (Modem Codec' 97) controller will be enabled; if not, it is disabled. Disable the controller if you want to use other controller cards to connect to a modem. Settings: *Auto, Disabled*.

Set Super I/O

Press <Enter> to enter the sub-menu and the following screen appears:



Onboard FDC

This is used to enable or disable the onboard Floppy controller.

Option	Description
Auto	BIOS will automatically determine whether to enable the onboard Floppy controller or not.
Enabled	Enables the onboard Floppy controller.
Disabled	Disables the onboard Floppy controller.

Onboard Serial Port A

These items specify the base I/O port addresses of the onboard Serial Port 1 (COM A)/Serial Port 2 (COM B). Selecting *Auto* allows AMIBIOS to automatically determine the correct base I/O port address. Settings: *Auto*, *3F8/COM1*, *2F8/COM2*, *3E8/COM3*, *2E8/COM4* and *Disabled*.

Serial Port B Mode

This item sets the operation mode for Serial Port B. Settings: *Normal*, *1.6uS*, *3/16 Baud* and *ASKIR* (the last three operation modes are settings options for IR function).

IR Pin Select

Set to *IRRX/IRTX* when using an internal IR module connected to the IR connector. Set to *SINB/SOUTB*. when connecting an IR adapter to COM B.

Onboard Parallel Port

This field specifies the base I/O port address of the onboard parallel port. Selecting *Auto* allows AMIBIOS to automatically determine the correct base I/O port address. Settings: *Auto*, *378*, *278*, *3BC* and *Disabled*.

Parallel Port Mode

This item selects the operation mode for the onboard parallel port: *ECP*, *Normal*, *Bi-Dir* or *EPP*.

EPP Version

The item selects the EPP version used by the parallel port if the port is set to *EPP* mode. Settings: *1.7* and *1.9*.

Parallel Port IRQ

When *Onboard Parallel Port* is set to *Auto*, the item shows *Auto* indicating that BIOS determines the IRQ for the parallel port automatically.

Parallel Port DMA Channel

This feature needs to be configured only when *Parallel Port Mode* is set to the *ECP* mode. When *Parallel Port* is set to *Auto*, the field will show *Auto* indicating that BIOS automatically determines the DMA channel for the parallel port.

PC Health Status

This section shows the status of your CPU, fan, overall system status, etc. Monitor function is available only if there is hardware monitoring mechanism onboard.

AMIBIOS NEW SETUP UTILITY - VERSION 3.31a	
PC Health Status	[Setup Help]
Chassis Intrusion Disabled	
CPU Temperature 88°C/176°F	
System Temperature 88°C/176°F	
CPU Fan Speed	
System Fan Speed	
Power Fan Speed	
Vcore	
3.30	
+ 5.00	
+12.00	
-12.00	
- 5.00	
Battery	
+5V SB	
F1:Help F4:Select Item +/-:Change Values F7:Setup Defaults	
Esc:Previous Menu Enter:Select ▶Sub-Menu F6:Hi-Performance	

Chassis Intrusion

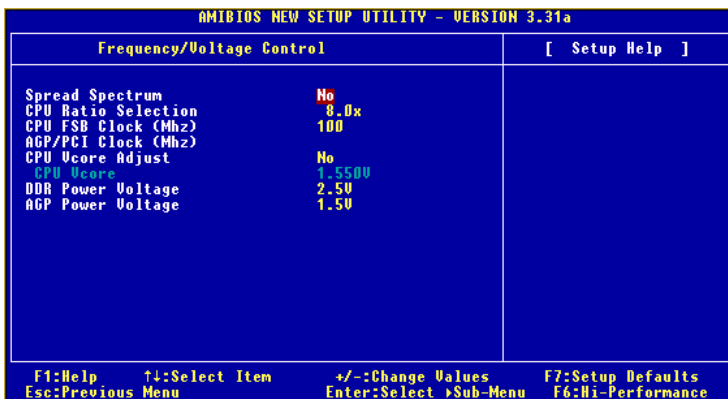
The field enables or disables the feature of recording the chassis intrusion status and issuing a warning message if the chassis is once opened. To clear the warning message, set the field to *Reset*. The setting of the field will automatically return to *Enabled* later. Settings: *Enabled, Reset, Disabled*.

CPU/System Temperature, CPU/System/Power Fan Speed, Vcore, 3.3V, +5.0V, +12.0V, -12.0V, -5.0V, Battery, +5V SB

These items display the current status of all of the monitored hardware devices/components such as CPU voltages, temperatures and all fans' speeds.

Frequency/Voltage Control

Use this menu to specify your settings for frequency/voltage control.



Spread Spectrum

When the motherboard's clock generator pulses, the extreme values (spikes) of the pulses creates EMI (Electromagnetic Interference). The Spread Spectrum function reduces the EMI generated by modulating the pulses so that the spikes of the pulses are reduced to flatter curves. If you do not have any EMI problem, leave the setting at *No* for optimal system stability and performance. But if you are plagued by EMI, setting to *Enabled* for EMI reduction. Remember to disable Spread Spectrum if you are overclocking because even a slight jitter can introduce a temporary boost in clockspeed which may just cause your overclocked processor to lock up.

CPU Ratio Selection

This setting controls the multiplier that is used to determine the internal clock speed of the processor relative to the external or motherboard clock speed.

CPU FSB Clock (Mhz)

This item allows you to select the CPU Front Side Bus clock frequency (in MHz) and overclock the processor by adjusting the FSB clock to a higher frequency.

AGP/PCI Clock (Mhz)

This item allows you to select the AGP/PCI clock frequency (in MHz) by adjusting the AGP/PCI clock to a higher frequency.

CPU Vcore Adjust

The setting allows you to adjust the CPU Vcore voltage. Available options: Yes, No.

CPU Vcore

The setting is adjustable if you set the "CPU Vcore Adjust" to "Yes". Settings: 1.550V, 1.575V, 1.600V, 1.625V, 1.650V, 1.675V, 1.700V, 1.725V, 1.750V, 1.775V, 1.800V, 1.825V, 1.850V.

**MSI Reminds You...**

Changing CPU Ratio/Vcore could result in the instability of the system; therefore, it is NOT recommended to change the default setting for long-term usage.

DDR Power Voltage

Adjusting the DDR voltage can increase the DDR speed. Any changes made to this setting may cause a stability issue, so ***changing the DDR voltage for long-term purpose is NOT recommended.***

AGP Power Voltage

AGP voltage is adjustable in the field, allowing you to increase the performance of your AGP display card when overclocking, but the stability may be affected.

Set Supervisor/User Password

When you select this function, a message as below will appear on the screen:



Type the password, up to six characters in length, and press <Enter>. The password typed now will replace any previously set password from CMOS memory. You will be prompted to confirm the password. Retype the password and press <Enter>. You may also press <Esc> to abort the selection and not enter a password.

To clear a set password, just press <Enter> when you are prompted to enter the password. A message will show up confirming the password will be disabled. Once the password is disabled, the system will boot and you can enter Setup without entering any password.

When a password has been set, you will be prompted to enter it every time you try to enter Setup. This prevents an unauthorized person from changing any part of your system configuration.

Additionally, when a password is enabled, you can also have AMIBIOS to request a password each time the system is booted. This would prevent unauthorized use of your computer. The setting to determine when the password prompt is required is the PASSWORD CHECK option of the ADVANCED BIOS FEATURES menu. If the PASSWORD CHECK option is set to *Always*, the password is required both at boot and at entry to Setup. If set to *Setup*, password prompt only occurs when you try to enter Setup.



MSI Reminds You...

About Supervisor Password & User Password:

Supervisor password: Can enter and change the settings of the setup menu.

User password: Can only enter but do not have the right to change the settings of the setup menu.

Load High Performance/BIOS Setup Defaults

The two options on the main menu allow users to restore all of the BIOS settings to High Performance defaults or BIOS Setup defaults. The High Performance Defaults are the values set by the mainboard manufacturer for the best system performance but probably will cause a stability issue. The BIOS Setup Defaults are the default values also set by the mainboard manufacturer for stable performance of the mainboard.

When you select Load High Performance Defaults, a message as below appears:



[Load High Performance Defaults]
WARNING! This default might have potential reliability risk.
Press [Enter] to Continue
Or [ESC] to Abort

Pressing ‘Enter’ loads the default BIOS values that enable the best system performance but may lead to a stability issue.



MSI Reminds You...

The option is for power or overclocking users only. Use of high performance defaults will tighten most timings to increase the system performance. Therefore, a high-end system configuration is a must, which means you need high-quality VGA adapter, RAM and so on. We don't recommend that users should apply the high performance defaults in their regular systems. Otherwise, the system may become unstable or even crash. If the system crashes or hangs after enabling the feature, please CLEAR CMOS DATA to resolve the problem. For more information, refer to "Clear CMOS Jumper:JBAT1" in Chapter 2.

When you select Load BIOS Setup Defaults, a message as below appears:



[Load BIOS Setup Defaults]
Press [Enter] to Continue
Or [ESC] to Abort

Pressing ‘Enter’ loads the default values that are factory settings for stable system performance.

Appendix A: Using 4- or 6-Channel Audio Function

The motherboard comes with C-Media 8738MX/LX chip, which provides support for 6-channel audio output, including 2 Front, 2 Rear, 1 Center and 1 Subwoofer channel SPDIF out. C-Media 8738MX/LX allows the board to attach 4 or 6 speakers for better surround sound effect. The section will tell you how to install and use 4-/6-channel audio function on the board.

TOPICS

<i>Installing C-Media Drivers</i>	<i>A-2</i>
<i>Hardware Configuration</i>	<i>A-3</i>
<i>Software Configuration</i>	<i>A-4</i>
<i>Using 4- or 6- Channel Audio Function</i>	<i>A-13</i>

Installing C-Media Drivers

The mainboard is able to transform the audio connectors on the back panel from 2-channel to 4-/6-channel. To use the function, you need to install the C-Media drivers.

To install C-Media drivers:

1. Insert the companion CD into the CD-ROM drive. The setup screen will automatically appear.
2. Click on **C-Media Sound Drivers**.
3. Follow the on-screen instructions to complete installation.
4. Restart the system.



MSI Reminds You...

*For Windows NT4.0, you need to install the C-Media Sound Drivers **manually**.*

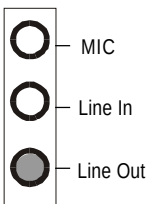
Hardware Configuration

After installing the audio driver, you are able to use the 4-/6-channel audio feature now. To enable 4- or 6-channel audio operation, first connect 4 or 6 speakers to the appropriate audio connectors, and then select 4- or 6-channel audio setting in the software utility.

There are two ways to utilize the function and connect the speakers to your computer:

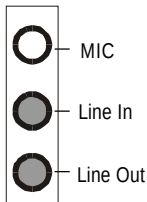
- *Use the optional S-Bracket.* If your motherboard supports S-Bracket and you have installed S-Bracket in the computer, you can connect two speakers to back panel's Line-Out connector, and the rest of speakers to S-Bracket.
- *Use the back panel only (without S-Bracket).* If you do not have a S-Bracket, you can connect all speakers to the audio connectors on the back panel.

After installing the C-Media drivers, you can attach the speakers for 4-/6-channel audio output. Always connect the speakers to the LINE OUT connectors. Different connector configurations for 2-/4-/6-channel operations are listed below:



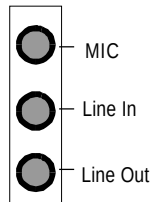
2-Channel

In 2-channel configuration, Line Out, Line In and MIC functions all exist.



4-Channel

When set to 4-channel configuration, LINE IN function DOES NOT WORK any more.



6-Channel

When set to 6-channel configuration, LINE IN and MIC functions DO NOT WORK anymore.

Software Configuration

To have 4-/6-channel audio work, you must set appropriate configuration in the C-Media software application.

To set the Volumn control:

1. Click the C-Media Mixer icon  from the window tray on the bottom.
2. The following screen appears. Click the **VOL**  button.



3. Then you may adjust the following item:

 **Volume** : This is the master control over all outputs. The power of an output signal is determined by both of the volume slider and the slider for the individual output. To modify all the outputs, adjust the volume slider. To change individual output(s), adjust its (their) slider(s).

 **CD**: Regulates the CD drive audio input level.

 **MIC**: Regulates the input level of microphone.

 **WAVE**: Regulates wave (voice) playback levels.

 **MIDI**: Regulates the MIDI music play level.

 **AUX IN**: Regulates the Auxiliary input play level.

 **MONO IN**: Regulates the Mono input level.

 **LINE IN**: Regulates the Line-in level.

 **Advanced**: Regulates the advanced settings.

To set the Recording control:

1. Click the **REC**  button.
2. Then you may adjust the following item:

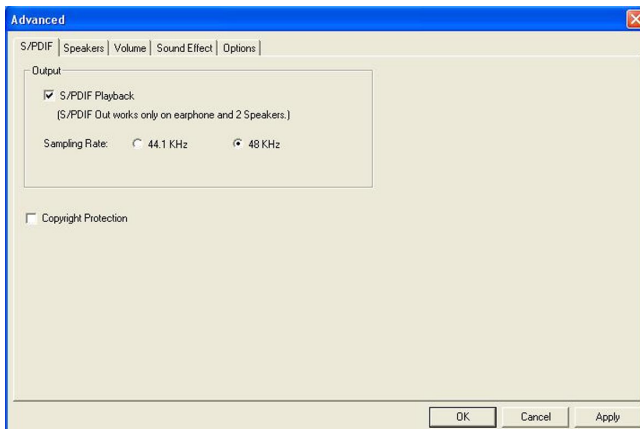
Using 4- or 6-Channel Audio Function



-  **CD:** Regulates the CD drive audio input level.
-  **MIC:** Regulates the input level of microphone.
-  **WAVE:** Regulates wave (voice) playback levels.
-  **FM:** Regulates the FM music play level.
-  **AUX IN:** Regulates the Auxiliary input play level.
-  **LINE IN:** Regulates the Line-in level.
-  **Advanced:** Regulates the advanced settings.

The Advanced-S/PDIF Dialog box:

1. Click the  button.



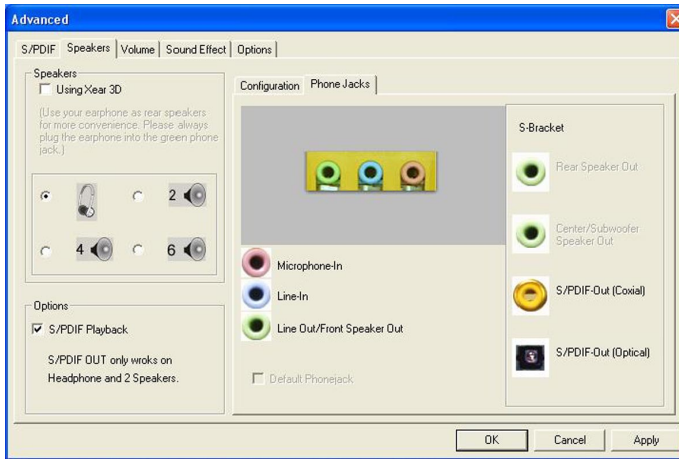
2. To enable **SPDIF-OUT** should be under 2-channel speaker mode since SPDIF standard only supports 2ch PCM audio data. If users would like to transmit multi-channels audio through SPDIF, users should choose AC-3 Dolby encoded format or DTS like DVD titles. Users can choose **44.1K or 48K Hz** sampling rate of PCM data when using SPDIF-Out.
3. The **Copyright Protection** is to enable SPDIF Copyright bit. Then recording copyright-protected input data will be not available.

The Advanced-Speakers Dialog box

There are 2 different software configurations in the “Advanced-Speakers” dialog depending the C-Media chipset on your have.

► With C-Media 8738MX chipset:

Use S/PDIF mode:



1. This dialogue provides an interface allowing you to set your speaker mode. CMI8738MX 6-channel supports earphone, 2ch, 4ch and 5.1ch mode.
2. The **Phone Jacks** tag shows the correct phone jack configuration for your motherboard.
3. You should make sure what type your speakers are, and what the correct configurations are. You can always refer to this appendix to make sure whether or not the connections of your speakers and plugs are correct.



MSI Reminds You...

1. The “S/PDIF Playback” option in the “S/PDIF” dialog will be enabled when you choose “earphone” or “2” in the “Speaker” option.
2. The “S/PDIF (Coaxial)” and “S/PDIF (Optical)” outputs are also available when you enable the “S/PDIF Playback” option.

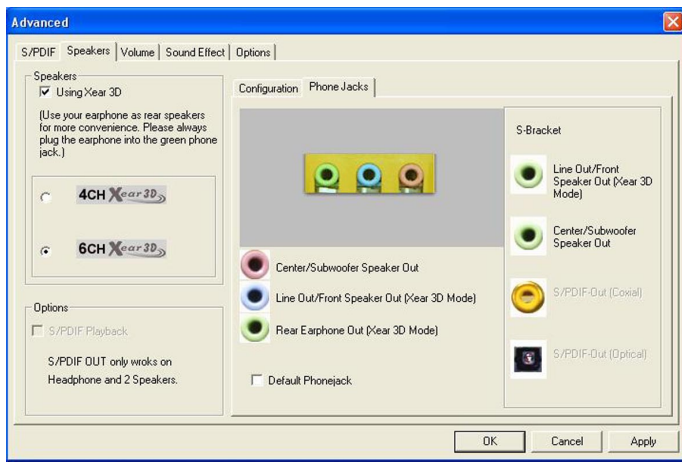
Use 6-channel:



MSI Reminds You...

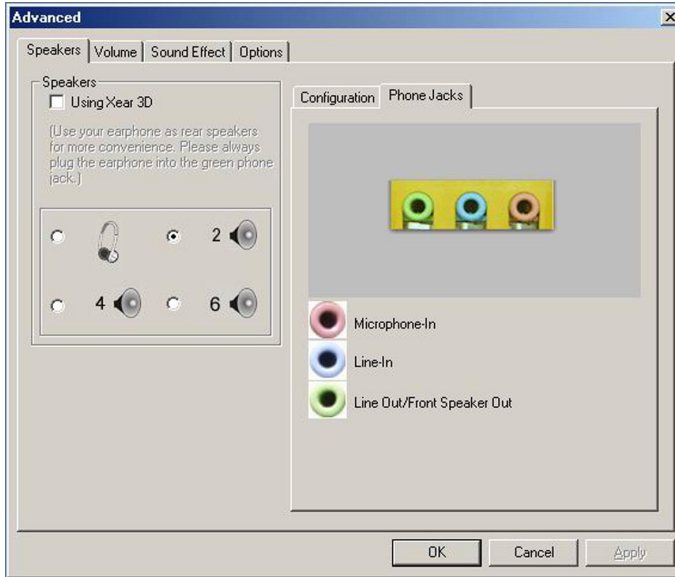
1. The "S/PDIF Playback" option in the "S/PDIF" dialog will be disabled when you choose "4" or "6" in the "Speaker" option.
2. Without using S-Bracket, the original "Microphone-in" will become "Center/Subwoofer Speaker Out" and the "Line-in" will become "Rear Speaker Out".
3. Please be sure to enable the **Default Phonejack** option if you have the optional S-Bracket, which will make the "Center/Subwoofer Speaker Out" as "micro-in" and the "Rear speaker Out" as "line-in".

Using Xear 3D:



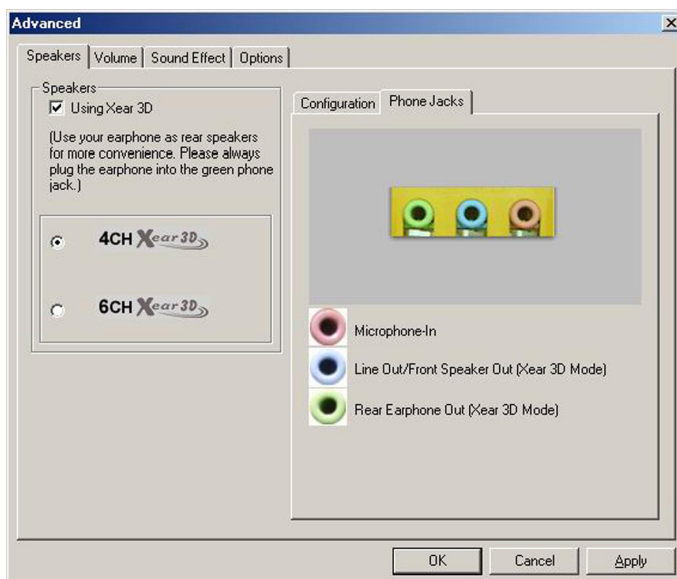
Xear 3D technology provides a different multi-channel listening method and environment settings. Users can use general open-style earphones to replace real speakers so that users will hear rear-out sounds from the earphone. Using Xear 3D technology, users will need less setup-up effort, cost and space without rear speakers. It will be also convenient for gamers to enjoy multi-channel 3D sound effect when playing games especially in Internet Cafe, which

► **With C-Media 8738LX chipset:**



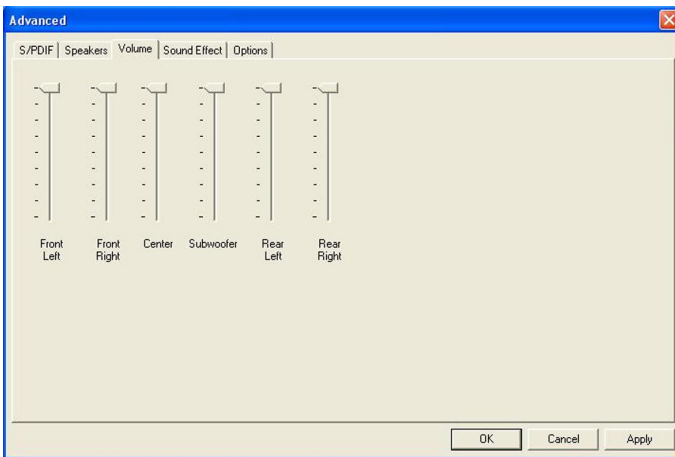
This dialogue provides an interface allowing you to set your speaker mode. CMI8738LX 6-channel supports earphone, 2ch, 4ch and 6ch mode.

Using Xear 3D:



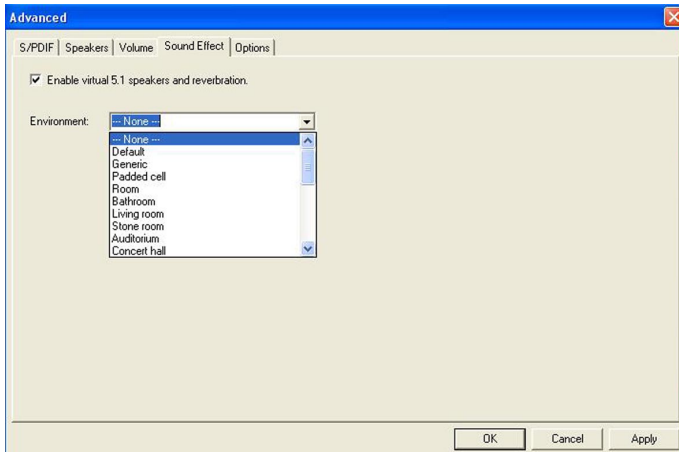
This diague provides an interface allowing you to set your speaker mode. CMI8738 LX 6-channel supports earphone, 4ch or 6ch mode in Xear 3D.

The Volume Dialog box:



The “Volume” dialog lets you adjust the volume of each output.

The Sound Effect box:

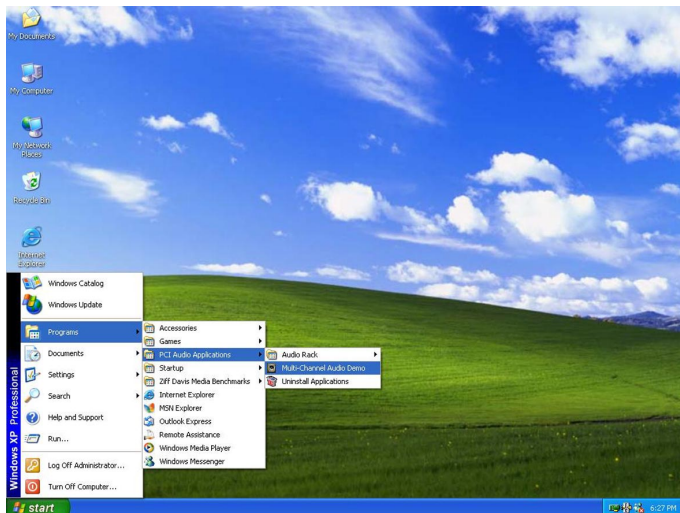


The “Sound Effect” dialog lets you choose the sound effect you like.

Multi-Channel Audio Demo:

You can use the “Multi-Channel Audio Demo” application to test the audio setting you are configuring/have configured.

The path will be showed as following:



Click on each audio output to test the sound effect and the sound configuration. ***Please note this demo will vary depending on your setting to the speakers.***



Using 4- or 6-Channel Audio Function

Attaching Speakers

To perform multichannel audio operation, connect multiple speakers to the system. You should connect the same number of speakers as the audio channels you will select in the software utility.

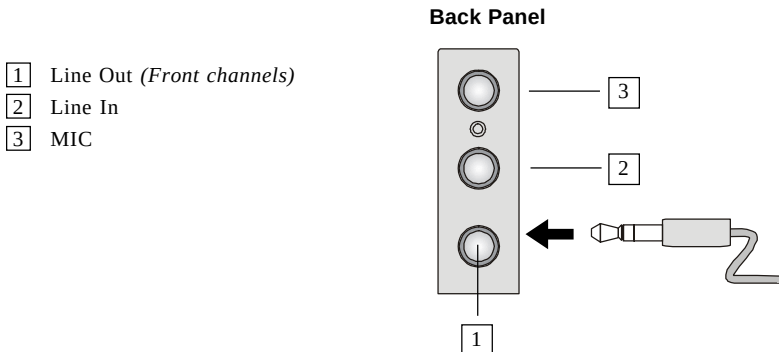
Using S-BRACKET connectors:

S-Bracket is an optional accessory. It gives access to analog and digital audio output by integrating both SPDIF (Sony & Philips Digital Interface) and analog LINE OUT connectors. To use the S-Bracket, you should select correct setting in the software utility. For information about the setting, refer to *Selecting 4- or 6-Channel Setting* later in the section.

Connector configurations for 2-, 4- and 6-channel using S-Bracket are described below:

2-Channel Analog Audio Output

We recommend that you should still attach the speakers to BACK PANEL's Line Out connector during 2-channel audio mode even though S-Bracket's Line Out connectors function properly.

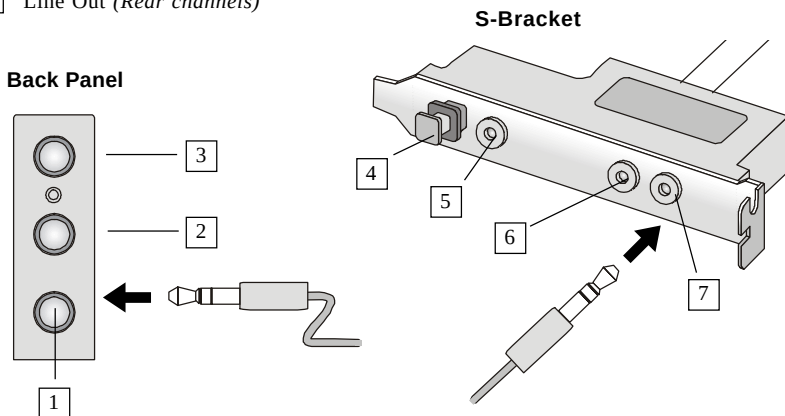


4-Channel Analog Audio Output

- 1 Line Out (*Front channels*)
- 2 Line In
- 3 MIC
- 4 Optical SPDIF jack
- 5 Coaxial SPDIF jack
- 6 Line Out (*Center and Subwoofer channel, but no functioning in this mode*)
- 7 Line Out (*Rear channels*)

Description:

Connect two speakers to back panel's Line Out connector and two speakers to one Line Out connector of S-Bracket.

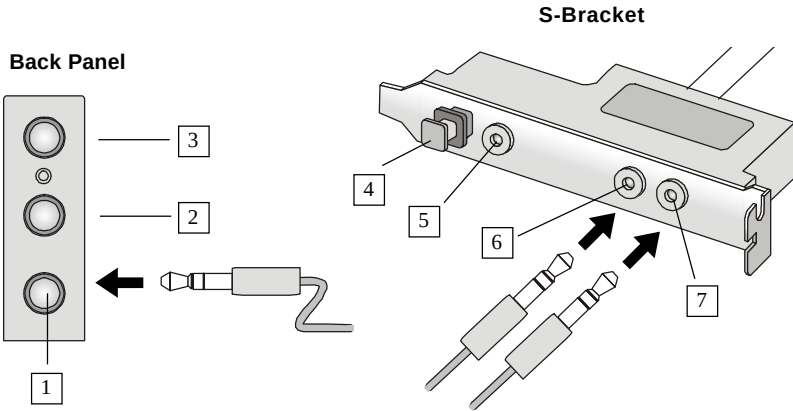


6-Channel Analog Audio Output

- 1** Line Out (*Front channels*)
- 2** Line In
- 3** MIC
- 4** Optical SPDIF jack
- 5** Coaxial SPDIF jack
- 6** Line Out (*Center and Subwoofer channel*)
- 7** Line Out (*Rear channels*)

Description:

Connect two speakers to back panel' s Line Out connector and four speakers to both Line Out connectors of S-Bracket.



Digital Audio Output (2-Channel only)

For digital audio output, use the SPDIF (Sony & Philips Digital Interface) connectors supplied by *S-Bracket*. First, connect the SPDIF speakers to the appropriate SPDIF jack, and then select the audio channel you desire through the control panel of speakers. The SPDIF connectors support 2-channel audio operation only.

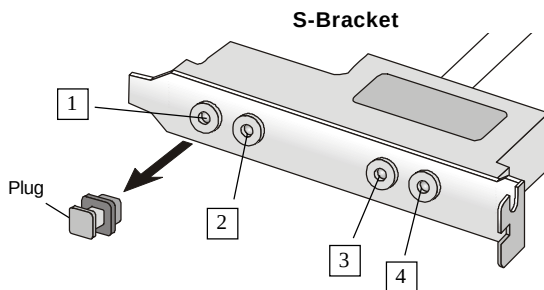
S-Bracket offers two types of SPDIF jacks: one for fiber-optic cable and the other for coaxial cable. Select the connector according to the type of your SPDIF speakers.

845PE Max2 ATX Mainboard

- 1 Optical SPDIF jack
- 2 Coaxial SPDIF jack
- 3 Line Out
- 4 Line Out

Description:

Select the correct type of SPDIF jack to connect SPDIF speakers. For optical connection, remove the plug from the S-Bracket before inserting the fiber-optic cable to it.



Appendix B: Installing ATA133 RAID Driver

The motherboard comes with optional ATA133 RAID connector, which provides support for high-end Ultra ATA133 RAID (0 or 1) hard drive interface specifications. This section provides the ATA133 RAID driver installation procedure when used with various operating systems.

If you have purchased an MBUltra133 for your existing PC, you will have to install the appropriate driver for your current operating system.

If you own a PC with an existing MBUltra133 card, drivers were already installed with the system. You would only need to re-install drivers when re-installing an operating system or installing an updated driver.

TOPICS

Installing Drivers

B-2

Installing Drivers

Windows 2000: Installing driver during new Windows 2000 installation

1. Start the installation:
 - a. Floppy Install: Boot the computer with the Windows 2000 installation diskettes.
 - b. Floppyless Install: Boot from floppy and type “WINNT”. After files have been copied, the system will reboot. On the reboot, after the message “Setup is inspecting your computer’s hardware configuration...” appears, press <F6>.
 - c. CD-ROM Install: Boot from the CD-ROM. After the message “Press F6 if you need to install third party SCSI or RAID driver” appears, press <F6>.
2. When the “Windows 2000 Setup” window is generated, press “S” to specify an additional device(s)
3. Insert the Promise Technology® driver diskette into drive A: and press “Enter” key.
4. Choose “Win2000 Promise MBUltra133 IDE Controller” from the list appearing on screen, and then press the “Enter” key.
5. The Windows 2000 Setup screen will appear again saying “Setup will load support for the following mass storage devices:” The list will include “Win2000 Promise MBUltra133 IDE Controller”.

NOTE: *If you need to specify any additional devices to be installed, do so at this time. Once all devices are specified, continue to the next step –*
6. From the Windows 2000 Setup screen, press the “Enter” key. Setup will now load all device files and then continue the Windows 2000 installation.

Windows 2000: Installing driver in existing Windows 2000 system

After installing the MBUltra133 card and rebooting your system, Windows 2000 setup will show a “New Hardware Found” dialog box. Under Windows 2000, “PCI Mass Storage Controller” will be displayed.

1. Choose “Add New Hardware Wizard” from the list, and then press “Enter”.

2. Choose “Add/Troubleshoot a device” and press “next” then new hardware wizard will show device list.
3. Choose “Mass Storage controller” and press “next” and next screen press “finish”.
4. Choose “display a list the known drivers for this device so that I can choose a specific driver “then press “next”.
5. It will show all Windows 2000 supported SCSI adapter drivers. Press “Have disk”.
6. Insert the MBUltra133 driver diskette in drive A:.
7. Type “A:\Win2000” in the text box. Then press “ OK ”.
8. Choose “Win2000 Promise MBUltra133 IDE Controller” from the list that appears on screen, and then press the “Next” key.
9. Press “Yes“ to confirm continuing the installation and copy the driver to system.
10. Remove the floppy diskette and click on “Finish” to restart the system. Windows 2000 will then restart for the driver installation to take effect.

Confirming Windows 2000 Installation

1. From Windows 2000, open the Control Panel from “My Computer” followed by the System icon.
2. Choose the “Hardware” tab, and then click the “Device Manager” tab.
3. Click the “+” in front of “SCSI controllers”. “Win2000 Promise MBUltra133 IDE Controller” should appear.



MSI Reminds You...

*If you will be moving the boot drive containing the existing Windows 2000 operating system to the MBUltra133 card, the MBUltra133 driver **MUST** be loaded on to this hard drive while it is still attached to your existing hard drive controller. Never attach this drive or any other hard drive to the MBUltra133 controller card before completing this step.*

Installing Driver During New Windows XP Installation

1. Start the installation:
 - a. Floppy Install: Boot the computer with the Windows XP installation diskettes.
 - b. Floppyless Install: Boot from floppy and type “WINNT”. After files have been copied, the system will reboot. On the reboot, after the message “Setup is inspecting your computer’s hardware configuration...” appears, press <F6>.
 - c. CD-ROM Install: Boot from the CD-ROM. Press <F6> after the message “Press F6 if you need to install third party SCSI or RAID driver” appears.
2. When the “Windows XP Setup” window is generated, press “S” to specify an additional device(s)
3. Insert the Promise Technology® driver diskette into drive A: and press “Enter” key.
4. Choose “WinXP Promise MBUltra133 IDE Controller” from the list that appears on screen, and then press the “Enter” key.

NOTE: *Immediately following the loading of the selected driver the Installation Program will notify you of following:*

“The driver you provided seems to be **newel** than the Windows default driver.

Windows already has a driver that you can use for “WinXP Promise MBUltra133 IDE Controller”.

Unless the device manufacture prefers that you use the driver on the floppy disk, you should use the driver in Windows.”

5. Press “S” to use the driver on the floppy disk, and then press “enter” to continue with installation.

If you press “enter” to use “Windows default driver”, you will encounter the following error message in the next phase of the installation:

“Setup did not find any hard disk drives installed in your computer”

NOTE: *Restart installation and then use option “S” to load driver from floppy disk.*

6. The Windows XP Setup screen will appear again saying “Setup will load support for the following mass storage devices:” The list will include “WinXP Promise MBUltra133 IDE Controller”.

NOTE: *If you need to specify any additional devices to be installed, do so at this time. Once all devices are specified, continue to the next step –*

7. From the Windows XP Setup screen, press the Enter key. Setup will now load all device files and then continue the Windows XP

Installing Driver in existing Windows XP System

After installing the MBUltra133 card and rebooting your system, Windows XP setup will show a “Found New Hardware” dialog box. Under Windows XP, “Mass Storage Controller” will be displayed.

1. In the A:\ drive, insert the MBUltra133 driver diskette.
2. Choose “Install the software automatically” and then press the “Enter” key.
3. Choose “WinXP Promise MBUltra133 IDE Controller” from the list that appears on screen, and then press the “Enter” key.
4. If using a driver that has not been digitally signed by Microsoft, you will be asked if you want to continue the installation. Click on “Continue anyway”.
5. When the New Hardware Wizard has finished installing the Promise Ultra ATA 133 software, click on “Finish”.

Confirming Windows XP Installation

1. From Windows XP, open the Control Panel from “My Computer”.
2. Click on “Performance and maintenance”.
3. Click on the “System” icon.
4. Choose the “Hardware” tab, and then click the “Device Manager” tab.
5. Click the “+” in front of “SCSI controllers”. “WinXP Promise MBUltra133 IDE Controller” should appear.



MSI Reminds You...

If you will be moving the boot drive containing the existing Windows XP operating system to the MBUltra133 card, the MBUltra133 driver MUST be loaded on to this hard drive while it is still attached to your existing hard drive controller. Do not attach this drive or any other hard drive to the MBUltra133 controller card before completing this step.

Installing Drivers During New Windows NT 4.0 Installation

1. Start the system installation by booting from the Windows NT disk:
 - a. Floppy install: boot the system with the Windows NT installation diskettes.
 - b. Floppyless install: boot from floppy and type "WINNT /B". After files have been copied, the system will reboot. On the reboot, press the "F6" key when the message "Setup is inspecting your computer's hardware configuration.." appears.
 - c. CD-ROM disk install: boot from the CD-ROM disk and press the "F6" key when the message "Setup is inspecting your computer's hardware configuration.." appears.
2. When the "Windows NT Setup" window is generated, press "S" to Specify an Additional Device(s).
3. Use "↑" or "↓" to select "Other" and press the "Enter" key.
4. Insert the Promise Technology® driver diskette into drive A: and press the "Enter" key.
5. Choose "WinNT Promise MBUltra133 IDE Controller" from the list appearing on screen, then press the "Enter" key.
6. The Windows NT Setup screen will appear again saying "Setup will load support for the following mass storage devices:" The list will include "WinNT Promise MBUltra133 IDE Controller".

NOTE: *If you need to specify any additional devices to be installed, do so at this time. Once all devices are specified, continue to the next step –*

7. From the Windows NT Setup screen, press the Enter key. Setup will

now load all device files and then continue the Windows NT installation.

8. After a successful installation, the “SCSI Adapter Setup” box will show that the “WinNT Promise MBUltra133 IDE Controller” driver has been installed.

Installing Drivers with Existing Windows NT 4.0

1. Choose “Settings” from the “Start” menu.
2. Choose “Control Panel” from the “Settings” menu.
3. Double-click on the “SCSI Adapters” icon, which generates the “SCSI Adapters” dialog box.
4. Choose “Drivers,” and then press “Add.”
5. In the “Install Drivers” dialog box, press “Have Disk..”
6. When the “Install From Disk” appears, insert the “MBUltra133 Driver” diskette in drive A:.
7. Type “A:\NT4” in the text box, then choose “OK.”
8. When the “Install Driver” dialog box appears, select “WinNT Promise MBUltra133 IDE Controller” and then press “OK.”
9. When the “Select SCSI Adapter Option” dialog box appears, press “Install.”
10. After a successful installation, the “SCSI Adapter Setup” box will show that the “WinNT Promise MBUltra133 IDE Controller” driver has been installed.
11. Power off your system, and then attach your hard drive(s) (see page 4 for more details) to the MBUltra133 controller card.



MSI Reminds You...

If you wish to use your current bootable drive with the Windows NT4 operating system on the MBUltra133 , perform the steps below while the boot drive is still attached to your existing onboard IDE controller. Do not attach any drives to your MBUltra133 until the steps below are complete.

Installing Drivers During Windows Me/98 Installation

The following details the installation of the MBUltra133 drivers while installing Windows Me/98 (with the MBUltra133 controller card already in place). If you're installing the MBUltra133 drivers on a system with Me already installed, see "Installing Drivers with Existing Windows Me/98 System."

1. Install Windows Me/98 fully.
2. After installation, go the "Start" menu and choose "Settings."
3. From the "Settings" menu, choose "Control Panel."
4. In the "Control Panel" window, double-click on the "System" icon.
5. In the "System" window, choose the "Device Manager" tab.
6. In the hierarchical display under "Other Devices" is a listing for "PCI Mass Storage Controller." Choose it and then press the "Properties" button.
7. Choose the "Driver" tab in the "Properties" window, choose "Update Driver," and then press "Next."
8. Choose "Specify the location of the driver (Advanced)," then press "Next".
9. Insert the MBUltra133 Driver diskette into the A: drive.
10. Choose "Specify a Location," and then type "A:\WIN9X-ME" in the text box.
11. Press the "Next" button. A message informing you that Windows Me/98 has found "Win9x-ME Promise MBUltra133 IDE Controller" should appear.
12. Press "Next," then "Finish," then "Yes" when asked if you want to restart your computer. Be sure to remove the diskette from drive A:.

Installing Drivers with Existing Windows Me/98 System

The following section details the installation of MBUltra133 drivers on a system that has Windows Me/98 already installed and running. If you're installing the MBUltra133 drivers on a system during an installation of Windows Me, see "Installing Drivers During Windows Me/98 Installation."

1. After installing the MBUltra133 controller card and configuring the hard drives, power up the system and boot.
2. The "Add New Hardware Wizard" will appear, informing you that it

- has found a “PCI Mass Storage Controller.”
3. Click on “Next,” and from the generated list box, choose “Specify the location of the driver (Advanced).”
 4. Click on “Next,” and from the generated choices, choose “Specify a location.”
 5. Insert the “MBUltra133 Driver” diskette in drive A:.
 6. Type “A:\WIN9X-ME” in the text box that appears.
 7. Click on “Next.” A message informing you that Windows Me/98 has found “Win9x-ME Promise MBUltra133 IDE Controller” should appear.
 8. Click on “Next,” and then on “Finish.”
 9. Choose “Yes” when asked if you want to restart your computer. Be sure to eject the diskette from drive A:.

Confirming Driver Installation in Windows Me/98

To confirm that the driver has been properly loaded in Windows Me/98, perform the following steps:

1. Choose “Settings” from the “Start” menu.
2. Choose “Control Panel,” and then double-click on the “System” icon.
3. Choose the “Device Manager” tab, and then click the “+” in front of “SCSI & RAID controllers.” “Win9x-ME Promise MBUltra133 IDE Controller” should appear.

Troubleshooting

Q: Where will I find the model number of the mainboard?

A: There are two places where you can find the model number of the mainboard:

1. Somewhere between the PCI slots you shall find MS-xxxx or the marketing name like "K7T Turbo". You can also find the version number beside it.
2. At the back cover of the user's manual.

Q: What do you mean by PCB version 1?

A: PCB is printed circuit board. Saying PCB version 1 is the same as saying motherboard version 1.

Q: Why my motherboard BIOS sticker is "Phoenix BIOS" but when I boot up my system I saw that "Award BIOS" is being used?

A: Phoenix & Award already merged as one company. All MSI motherboard using Award BIOS comes with Phoenix logo sticker.

Q: How do I know what MSI D-LED or D-bracket light mean?

A: Please follow the special tech issue, http://www.msi.com.tw/support/techexpress/special_tech/smartled.htm

Q: I have got MSI Motherboard and when it says detecting drives, it detects them but says an error saying "Primary IDE Channel no 80 Conductor Cable Installed"

A: This is not a problem. It merely means that you're using an ATA-66 or ATA-100 HDD, but you're using the conductor 40 ATA-33 cable.

Q: I have high speed CPU cooling fan like Taisol CGK760092, Vantec CCK-6035D & Global Win WBK38. Can I install the fan directly to the motherboard?

A: We strongly recommend that you do NOT connect those described CPU fan directly to your motherboard, as it draws so much power, that it could damage it. Please use a 3-Pin to 4-Pin Cable that comes together with the fan.

Q: Can I use more than 512MB memory on Win9x or WinME?

A: No, you can't. You can only use more than 512MB memory on Win2000 or WinXP. This is a Microsoft OS issue. Please check <http://support.microsoft.com/support/kb/articles/Q108/0/79.ASP>

Q: I have tried to download the MSI Live Update utility from <http://www.msi.com.tw/support/liveupdate/livedriver.htm> but it keeps on failing?

A: This can be solved by one of the following suggestions: 1. Don't install zonealarm 2. Disable "WebTrap" of PC-cillin 2000 3. Disable any web based anti-virus Software.

Q: Can Live Update Series support WinXP?

A: Live Update Series version 215 can support WinXP. Download it from <http://www.msi.com.tw/support/liveupdate/livedriver.htm>

Q: After flashing the BIOS, my system for unknown reason doesn't want to boot, what should I do?

A: Please refer to the following suggestions: 1. Try the BIOS boot recovery feature as described in <http://www.msi.com.tw/support/bios/boot.htm> 2. Try to clear the CMOS. If problem still persists, ask your reseller for new BIOS chip or contact one of MSI office near your place for new BIOS chip <http://www.msi.com.tw/contact/main.htm>

Q: Should I update my BIOS, once a new BIOS is released?

A: A new BIOS is usually released due to the following reasons:

1. New function is supported
2. New BIOS source code

3. Bugs are found

4. Customer-specific request

When we release a new BIOS, there's usually a release note attached which lists the reason for the release. Refer to this release note and decide for yourself if upgrading to the new BIOS will be worth it. A word of advice, though, do not upgrade to the new BIOS, unless you really have to.

Q: How do I update the BIOS?

A: Please refer to <http://www.msi.com.tw/support/bios/note.htm> for details.

Q: How do I identify the BIOS version?

A: Upon boot-up, the 1st line appearing after the memory count is the BIOS version. It is usually in the format:

1. For older model number:

AG76091096 where:

1st digit refers to BIOS maker as A = AMI(R) W = AWARD(R) P = PHOENIX (R).

2nd digit refers to the internal chipset code.

3rd digit refers to the processor class as 5 = 486, 7 = 586, 8 = 686.

4th digit is incremental.

091096 refers to the date this BIOS is released.

2. For newer model number:

W5139MSV1.0 091096 where:

1st digit refers to BIOS maker as A = AMI(R) W = AWARD(R) P = PHOENIX (R).

2nd - 5th digit refers to the model number.

6th - 7th digit refers to the customer as MS = all standard customers.

V1.0 refers to the BIOS version.

091096 refers to the date this BIOS is released.

Q: After flashing the bios and rebooting the system, the screen went blank.

A: *For AMI BIOS*

Rename the desired AMI BIOS file to AMIBOOT.ROM and save it on a floppy disk. e.g. Rename A569MS23.ROM to AMIBOOT.ROM

Insert this floppy disk in the floppy drive. Turn On the system and press and hold Ctrl-Home to force update. It will read the AMIBOOT.ROM file and recover the BIOS from the A drive.

When 4 beeps are heard you may remove the floppy disk and restart the computer.

For Award BIOS

Make a bootable floppy disk

Copy the Award flash utility & BIOS file to the said floppy disk

Create an autoexec.bat with "awdfl535 biosfilename" in the content e.g.
awdfl535a619mj21.bin

Boot up system with the said floppy (it will take less than 2 minutes before screen comes out)

Re-flash the BIOS & reboot.

Glossary

ACPI (*Advanced Configuration & Power Interface*)

This power management specification enables the OS (operating system) to control the amount of power given to each device attached to the computer. Windows 98/98SE, Windows 2000 and Windows ME can fully support ACPI to allow users managing the system power flexibly.

AGP (*Accelerated Graphics Port*)

A new, high-speed graphics interface that based on PCI construction and designed especially for the throughput demands of 3-D graphics. AGP provides a direct channel (32-bit wide bus) between the display controller and main memory for high graphics quality and performance.

Bluetooth

Bluetooth refers to a worldwide standard for the wireless exchange of data between two devices. Bluetooth requires that a low-cost transceiver chip be included in each device. The transceiver transmits and receives in a previously unused frequency band of 2.45 GHz that is available globally (with some variation of bandwidth in different countries). In addition to data, up to three voice channels are available. Each device has a unique 48-bit address from the IEEE 802 standard. Connections can be point-to-point or multipoint. The maximum range is 10 meters. Data can be exchanged at a rate of 1 megabit per second (up to 2 Mbps in the second generation of the technology).

BIOS (*Basic Input/Output System*)

On PCs, an essential software that contains all the control code of input/output interface (such as keyboard, disk drives, etc.). It executes hardware test on booting the system, starts the OS, and provides an interface between the OS and the components. The BIOS is stored in a ROM chip.

Bus

A set of hardware lines within the computer system, through which the data is transferred among different components. In a PC, the term **bus** usually refers to a local bus that connects the internal components to the CPU and main memory.

Cache

A special memory subsystem that is used to speed up the data transfer. It stores the

contents of frequently accessed RAM locations and the addresses where these data items are stored.

Chipset

A collection of integrated chips designed to perform one or more related functions. For example, a modem chipset contains all the primary circuits for transmitting and receiving data; a PC chipset provides the electronic interfaces between all subsystems.

Clock Cycle

Clock cycle (or tick) is the smallest unit of time recognized by a device. For personal computers, clock cycles generally refer to the main system clock, which runs at 66 MHz. This means that there are 66 million clock cycles per second. Since modern CPUs run much faster (up to 533 MHz), the CPU can execute several instructions in a single clock tick.

CMOS (*Complementary Metal-Oxide Semiconductor*)

CMOS is a widely used type of semiconductor, which features high speed and low power consumption. PCs usually contain a small amount of battery-powered CMOS memory to retain the date, time, and system setup parameters.

DRAM (*Dynamic RAM*)

A most common type of computer memory. It usually uses one transistor and a capacitor to represent a bit. As the development of technology, the memory type and specification used in computer becomes variety, such as SDRAM, DDR SDRAM, and RDRAM. For further instruction, please see the table below:

Dynamic RAM (DRAM) Memory Technologies					
Type	First Used	Clock Rate	Bus* Width	Peak Bandwidth	Volts
FPM (60,70ns)	1990	25MHz	64 bits	200 MBps	5v
EDO (50,60,70ns)	1994	40MHz	64 bits	320 MBps	5v
SDRAM (66MHz)	1996	66MHz	64 bits	528 MBps	3.3v
SDRAM (100MHz)	1998	100MHz	64 bits	800 MBps	3.3v
SDRAM (133MHz)	1999	133MHz	64 bits	1.1 GBps	3.3v
RDRAM (Direct Rambus)	1999	400MHz	16 bits	1.6 GBps	2.5v
DDR SDRAM (100MHz)	2000	100MHz	64 bits	1.6 GBps	3.3v
DDR SDRAM (133MHz)	2000	133MHz	64 bits	2.1 GBps	3.3v
* Memory channel width (64 bits started with 75MHz Pentium)					

Source: *Computer Desktop Encyclopedia*

ECC Memory (*Error Correcting Code Memory*)

A type of memory that contains special circuitry for testing the accuracy of data and correcting the errors on the fly.

EEPROM

Acronym for Electrically Erasable Programmable Read-Only Memory. An EEPROM is a special type of PROM that can be erased by exposing it to an electrical charge. Like other types of PROM, EEPROM retains its contents even when the power is turned off. Also like other types of ROM, EEPROM is not as fast as RAM. EEPROM is similar to flash memory (sometimes called flash EEPROM). The principal difference is that EEPROM requires data to be written or erased one byte at a time whereas flash memory allows data to be written or erased in blocks. This makes flash memory faster.

EIDE

Short for Enhanced IDE, a newer version of the IDE mass storage device interface standard developed by Western Digital Corporation. It supports data rates of between 4 and 16.6 MBps, about three to four times faster than the old IDE standard. In addition, it can support mass storage devices of up to 8.4 gigabytes, whereas the old standard was limited to 528 MB. Because of its lower cost, enhanced EIDE has replaced SCSI in many areas. There are four EIDE modes defined. The most common is Mode 4, which supports transfer rates of 16.6 MBps. There is also a new mode, called ATA-3 or Ultra ATA, that supports transfer rates of 33 MBps.

EISA (*Extended Industry Standard Architecture*)

EISA is a standard bus (computer interconnection) architecture that extends the ISA standard to a 32-bit interface. It was developed in part as an open alternative to the proprietary Micro Channel Architecture (MCA) that IBM introduced in its PS/2 computers. EISA data transfer can reach a peak of 33 megabytes per second.

ESCD (*Extended System Configuration Data*)

It is a format for storing information about Plug-and-Play (PnP) devices in the BIOS. Windows and the BIOS access the ESCD area each time you re-boot your computer

External Cache

Short for Level 2 cache, cache memory that is external to the microprocessor. In general, L2 cache memory, also called the secondary cache, resides on a separate chip from the microprocessor chip. Although, more and more microprocessors are including L2 caches into their architectures.

IDE (*Integrated Drive Electronics*)

A type of disk-drive interface widely used to connect hard disks, CD-ROMs and tape drives to a PC, in which the controller electronics is integrated into the drive itself, eliminating the need for a separate adapter card. The IDE interface is known as the ATA (AT Attachment) specification.

IEEE 1394

A new, high speed external bus standard, also known as **FireWire** or **iLink**, which supports data transfer rates of up to 400 Mbps for connecting up to 63 external devices.

Internal Cache

Short for Level 1 cache, a memory cache built into the microprocessor. The L1 cache is also called the primary cache.

IrDA (*Infrared Data Association*)

A group of device vendors, including computer, component and telecommunications, who have developed a standard for transmitting data via infrared light waves. This enables you to transfer data from one device to another without any cables.

IRQ (*Interrupt Request Line*)

IRQs are hardware lines over which devices can send interrupt signals to the microprocessor. When you add a new device to a PC, you sometimes need to set its IRQ number by setting a DIP switch. This specifies which interrupt line the device may use. IRQ conflicts used to be a common problem when adding expansion boards, but the Plug-and-Play specification has removed this headache in most cases.

ISA (*Industry Standard Architecture*)

ISA is a standard bus (computer interconnection) architecture that is associated with the IBM AT motherboard. It allows 16 bits at a time to flow between the motherboard circuitry and an expansion slot card and its associated device(s). Also see EISA and MCA.

LAN (*Local Area Network*)

A computer network that covers a relatively smaller area, such as in a building or an enterprise. It is made up of servers, workstations, shared resources, a network operating system and a communications link. These individual PCs and devices on a LAN are known as “nodes”, and are connected by cables to access data and devices anywhere on the LAN, so that many users can share expensive devices and data.

LBA (*Logical Block Addressing*)

Logical block addressing is a technique that allows a computer to address a hard disk larger than 528 megabytes. A logical block address is a 28-bit value that maps to a specific cylinder-head-sector address on the disk. 28 bits allows sufficient variation to specify addresses on a hard disk up to 8.4 gigabytes in data storage capacity. Logical block addressing is one of the defining features of Enhanced IDE (EIDE), a hard disk interface to the computer bus or data paths.

LED (*Light Emitting Diode*)

A semiconductor device that converts electrical energy into light. Since it lights up (usually red) when electricity is passed through it, it is usually used for the activity lights on computer's component, such as disk drivers.

LPT (*Line Printer Terminal*)

Logical device name for a line printer; a name reserved by the MS-DOS for up to three parallel printer ports: LPT1, LPT2, and LPT3. It is frequently used by the OS to identify a printer.

Overclocking

Overclocking is resetting your computer so that the microprocessor runs faster than the manufacturer-specified speed (for example, setting an Intel 166 MHz (megahertz) microprocessor to run at 200 Mhz).

PCI (*Peripheral Component Interconnect*)

A local bus standard developed by Intel that first appeared on PCs in late 1993. PCI provides "plug and play" capability and allows IRQs to be shared. The PCI controller can exchange data with the system's CPU either 32 bits or 64 bits at a time.

PnP (*Plug and Play*)

A set of specifications that allows a PC to configure itself automatically to work with peripherals. The user can "plug" in a peripheral device and "play" it without configuring the system manually. To implement this useful feature, both the BIOS that supports PnP and a PnP expansion card are required.

POST (*Power On Self Test*)

During booting up your system, the BIOS executes a series of diagnostic tests, include checking the RAM, the keyboard, the disk drives, etc., to see if they are properly connected and operating.

PS/2 Port

A type of port developed by IBM for connecting a mouse or keyboard to a PC. The PS/2 port supports a mini DIN plug containing just 6 pins. Most modern PCs equipped with PS/2 ports so that the special port can be used by another device, such as a modem.

RAID

RAID (Redundant Array of Independent Disks; originally Redundant Array of Inexpensive Disks) is a way of storing the same data in different places (thus, redundantly) on multiple hard disks. By placing data on multiple disks, I/O operations can overlap in a balanced way, improving performance. Since multiple disks increases the mean time between failure (MTBF), storing data redundantly also increases fault-tolerance.

SCSI

Acronym for Small Computer System Interface. Pronounced "scuzzy," SCSI is a parallel interface standard used by Apple Macintosh computers, PCs, and many UNIX systems for attaching peripheral devices to computers. SCSI interfaces provide for faster data transmission rates (up to 80 megabytes per second) than standard serial and parallel ports. In addition, you can attach many devices to a single SCSI port, so that SCSI is really an I/O bus rather than simply an interface.

USB (*Universal Serial Bus*)

A hardware interface for low-speed peripherals such as the keyboard, mouse, joystick, etc. USB provides a maximum bandwidth of 12 Mbit/sec (Mbps) for connecting up to 127 peripheral devices to PC. USB features hot swap capability and multiple data streams, allows external devices to be plugged in and unplugged without turning the system off.

Virus

A program or a piece of code that infects computer files by inserting in those files copies of itself. The virus code is buried within an existing program, and is activated when that program is executed. All the viruses are man-made, and often have damaging side effects.

WLAN

Acronym for wireless local-area network. Also referred to as LAWN. A type of local-area network that uses high-frequency radio waves rather than wires to communicate between nodes.